

MAY 1963 35 CENTS

Popular Science

Monthly

We Test Those

HOT COMPACTS

PAGE 53



Lark Supercharged V-8



Falcon Sprint V-8



Tempest Le Mans V-8



Corvair Turbocharged
Spyder



Olds Turbocharged Jetfire

VACATIONING ON WHEELS: 26 pages on Tent Trailers •
Camping Vans • Piggyback Campers • Car-Top Sleepers • Station-Wagon Tents

WERNHER VON BRAUN
on Observatories in Space

Now You Can Have
Hi-Fi TV Pictures

Why Sports Records
Are Toppling



If we made a Thunderbird wagon...



it'd ride like this one!

Thunderbird's fabulous ride was the inspiration for the '63 Fords. Over ten million dollars was spent in perfecting this sensational new ride. Scores of improvements were made—from new front and rear suspensions to new butyl rubber body mounts.

When these changes were tailored to Ford Wagon dimensions,

Talk about wagons...your Ford Dealer has more to talk about

something totally new came to wagon living—a ride so incredibly smooth you'll have to try it to believe it.

Among the many options: V-8 engines up to 300-hp., bucket seats, sporty 4-speed floor shift, Swing-Away steering wheel. Standard items: power-operated rear window on 6- and 9-passenger models

and twice-a-year (or 6,000-mile) service-saving features. Drive the Country Squire—or new Country Sedan—at your Ford Dealer's!

FOR 60 YEARS THE SYMBOL OF DEPENDABLE PRODUCTS



America's longest, liveliest line of wagons

FORD
FALCON • FAIRLANE • FORD

Winchester still believes 22's are real rifles.

Left: Lever action rifle Model 250, \$56.95. Center: Semi-automatic rifle Model 290, \$52.95. Right: Pump action rifle Model 270, \$52.95. Specifications: Magazine Capacity—21 Short, 17 Long, and 15 Long Rifle cartridges interchangeably. Sights—Rear: Square notch, adjustable for elevation and windage. Front: Square post on streamline ramp. Receiver—Grooved for tip-off scope mounts. Bolt—Engine turned. Barrel—20"; 1 turn in 16"—right-hand twist. Overall Length—39". Stock Dimensions—Pull—13 1/4", drop at comb 1 1/4", drop at heel 2 1/4". Weight—5 lbs., approximate.



Here are three new Winchester 22's: a lever, an automatic, a pump. Which would be your favorite small game rifle?

These are man-sized rifles. Plain hard-working guns with plenty of guts instead of fancy frills.

Here's the heft, the feel and the honest wood-and-metal workmanship that have always placed a Winchester above the pack. These new 22's are hunting rifles, designed to deliver plenty of firepower just where you want it—for years and years and years.

If there's one word men have used most to describe why they won't be without a Winchester it's the word "honest."

An honest rifle being one that a man on a hunt can depend on—no matter how tough the going gets. When you're packing a Winchester you can be pretty sure it'll

work and shoot where you point it. That's as honest as a rifle can be. That's a real rifle. That's the only kind of rifle Winchester makes.

Next Month in Popular Science

- **The Fabulous Flying Boats.** Dramatic story of the giant planes that reigned briefly as queens of the transoceanic air lanes.
- **At Last—an Automatic Tape Changer.** Complete report on Revere's revolutionary stereo player-recorder that gives you up to 15 hours of music.
- **Jim Roe Tests the Mercruisers.** PS's boating editor wrings out the stern-drive power packages on Mercury's Lake X test center.
- **If Your Car Goes in the Water.** Astounding facts—and expert advice—on this terrifying accident that takes more than 400 lives a year.

Return postage must accompany all manuscripts submitted. We cannot be responsible for the loss of manuscripts or photos.

E. S. DUFFIELD, President

JOHN R. WHITING, Executive Vice-President and Publisher

EUGENE WATSON, Vice-President, Circulation

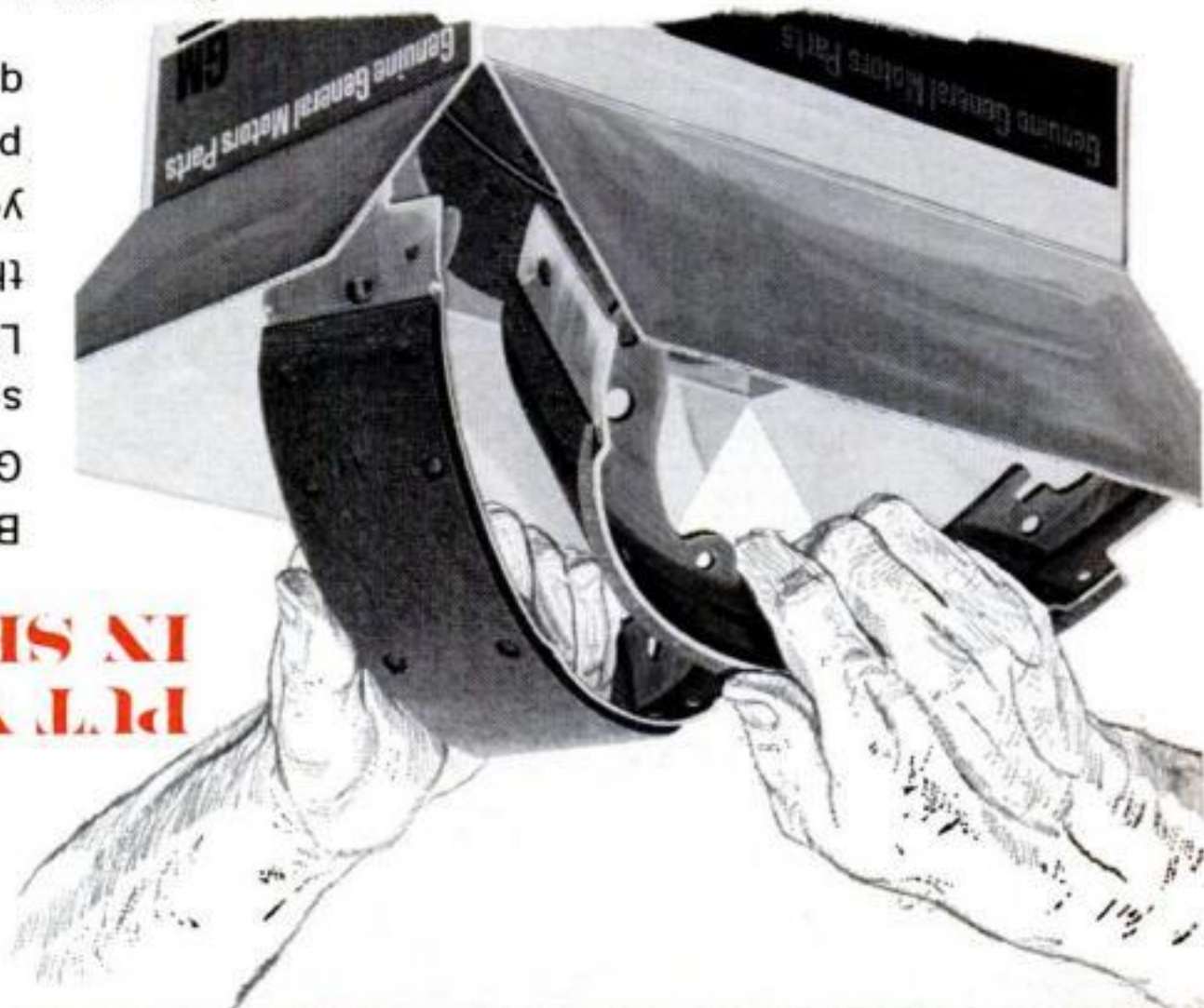
CHARLES S. THORN, Vice-President, Advertising

EDITORIAL OFFICES: 355 Lexington Ave., New York 17, N. Y.

PUBLISHED MONTHLY by Popular Science Publishing Co., Inc., 355 Lexington Ave., New York 17, N. Y.

SUBSCRIPTION SERVICE. New or renewal orders: Send to Popular Science Subscription Department, Boulder, Colo. One year \$4, 2 years \$7, 3 years \$9 in U.S., its possessions, and Canada. Elsewhere, 1 year \$6.50, 2 years \$12, 3 years \$17. Single copy 35¢. Subscription orders processed electronically. ● **All subscription adjustments:** Write to Robert Harlan, Popular Science, P.O. Box 1083, Boulder, Colo. For change of address allow four weeks; please give both old and new addresses. Notices of undelivered copies (Form 3579) to Mr. Harlan. ● **Second class postage paid at New York, N.Y., and at additional mailing offices.** Entered as second class matter at the Post Office Department, Canada. Printed in U.S.A. ● **ADVERTISING OFFICES.** NEW YORK: 355 Lexington Ave.; CHICAGO: 360 N. Michigan Ave.; DETROIT: 2810 Book Bldg.; SAN FRANCISCO: 703 Market St.; CLEVELAND: 1220 Huron Road; LOS ANGELES: 1709 W. Eighth St.; PORTLAND, ORE.: 520 S.W. Sixth Ave.; DENVER: 333 W. Colfax Ave.; SEATTLE: 101 Jones Bldg.

Copyright © 1963 by Popular Science Publishing Co., Inc. All rights reserved



Brakes need relining? See your General Motors dealer and be sure you get Genuine GM Brake Linings engineered to match the original quality built into your GM car or truck. His expert servicemen will install them quickly, precisely, economically.

PUT YOUR SAFETY IN SKILLED HANDS

*See your GM Dealer during May—National Safety Month

SEE YOUR QUALITY DEALER FOR THE BEST KIND OF SERVICE

GUARDIAN MAINTENANCE

CHEVROLET • PONTIAC • OLDSMOBILE • BUICK • CADILLAC • GMC TRUCK

2 POPULAR SCIENCE MAY 1963

24 Printed in U.S.A.





Demolition Expert

This is a Mercury outboard test driver dressing for work at our Lake X, Florida, proving grounds. He's paid to try to demolish Mercury outboards. His weapons include speed, "stand-still" idling, corrosion, underwater obstacles the size of telephone poles, sand bars and different fuel mixtures (many of them wrong). One of his deadliest weapons is "full throttle time." The idea here is literally to run the motor to death.

That's what he's starting now. He and his cohorts will alternate continuous 8-hour shifts night and day. They'll lock open the throttles on two 1963 Merc 1000's at full speed. The boat will average about 55 mph *continuously*... stopping only to take on fuel and change "experts." Every 24 hours, each motor will log about 1320 miles.

And, when you're reading this same magazine next month, our experts will still be trying to run these same two Mercs to death.

We pay these Lake "X-perts" to make sure you'll get more RUN for your money with Mercury.

MERCURY

100, 85, 65, 50, 35, 20, 9.8, and 6 hp outboards



MerCruiser Stern Drive
Power Packages • 310, 225,
190, 140, and 110 hp gasoline /
100 and 39 hp diesel

© 1963, KIEKHAEFER CORPORATION, Fond du Lac, Wisconsin,
and Toronto. Subsidiary of Brunswick Corporation

Robert P. Crossley
Editor

JAMES M. LISTON
Executive Editor

KENDALL W. GOODWYN
Managing Editor

ROBERT P. STEVENSON
Director, Products and Projects

HOWARD JENSEN
Art Director

Senior Editors
Alden P. Armagnac, Wallace Cloud
Everett H. Ortnier, Joan Steen

Automobile Editor
Devon Francis

Electronics and Technical Editor
Hubert Lockett

Home Workshop Editor
Sheldon M. Gallagher

Photography Editor
Robert L. Hering

Boating Editor
Jim Roe

West Coast Editor
Wesley S. Griswold

European Editor
David Scott

Associate Editors
Frank Dorr, Herbert O. Johansen
Alex Markovich
Ruth Westphal

Editorial Assistants
Eleanor Crapullo (Chief)
Anna Dallas
Barbara Weisheit

Art Editors
Herbert Anthony
Harry Samuels

Associate Art Editor
Richard J. Meyer

Art Associates
Robert Martin, Kenneth Buddington

Art Production Manager
Henry W. Kazmirowski

Photography
Robert D. Borst

JOHN R. WHITING, Executive Vice-President and Publisher

May 1963

Cover photo by Robert D. Borst



Better athletes? Or are gimmicks breaking those records? Page 58.



Under some Indy hoods: engines from Detroit. Page 75.



Vacation trip? Take a parlor, kitchen, and sink along. Page 117.

SPACE AND AVIATION

[Dr. Von Braun on Space Observatories • 14](#)
[First Nonstop Coast-to-Coast Flight • 82](#)
[I Drove a Jeep "on the Moon" • 90](#)

CARS AND DRIVING

[PS Tests the Hot Compacts • 53](#)
[Can Detroit Move In on Indy? • 75](#)

SPECIAL SECTION: VACATIONS ON WHEELS

[Tent Trailers: Buy or Rent One • 118](#)
[Camping Vans: Buy or Build 'Em • 121](#)
[Fitting Out a Corvan Camper • 122](#)
[Fitting Out an Econoline Camper • 125](#)
[Fitting Out a Microbus Camper • 128](#)
[Piggyback Campers: Kit Cuts Cost • 132](#)
[Piggyback Campers You Can Buy • 135](#)
[Piggyback Camper You Can Make • 137](#)
[Car-Top Sleeper You Can Build • 138](#)
[Hitch a Tent to Your Tailgate • 140](#)
[Upper Berth for a Station Wagon • 142](#)
[Car-Top Carrier for Add-On Space • 143](#)

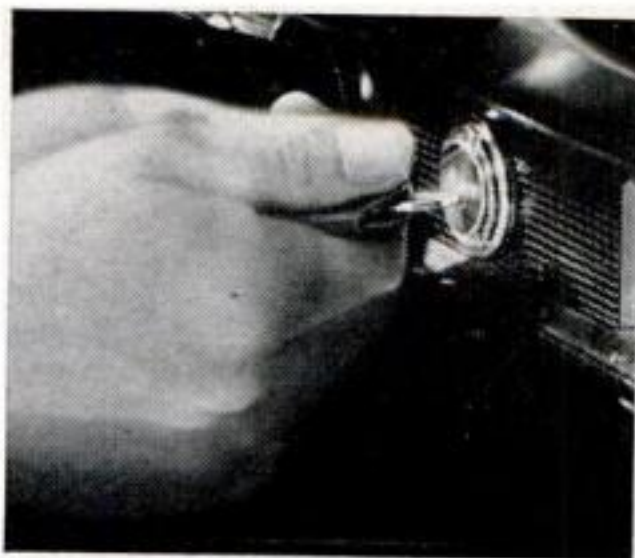
SCIENCE AND INVENTIONS

[U.S. Monorail Goes to Tokyo • 63](#)
[Seagoing Pad to Launch Satellites • 64](#)
[DNA: It Calls the Signals for Life • 66](#)
[Inventing Is Easier Than Ever! • 72](#)

SPECIAL REPORTS

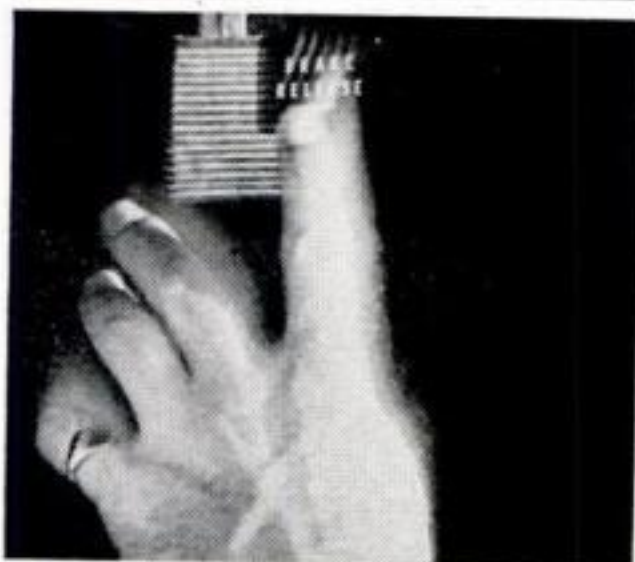
[Sports Records: Science or Supermen? • 58](#)
[They Fish for Diamonds • 85](#)

Contents continued on page 6



For people who like to sit at home and knit, Tempest is not.

We could go on claiming a Tempest to be the cat's whiskers until we're blue in the face. But what's the use if you think we're just tooting our let's-sell-more-cars trumpet?



Do yourself (and your friendly car tailor—us) a favor. Amble into your Pontiac dealer's and try a Tempest. Maybe a Le Mans convertible, now that the weather's warming up.



Then reluctantly (of course) pry yourself out of its deep bucket seat and go off somewhere by yourself to do some serious thinking. Choosing the right engine (V-8 or 4?) and transmission (stick shift or automatic*?) and axle ratio and color and all that jazz isn't the work of a minute.*

When you're ready, snatch an order form from a salesman and check off what you want in your Tempest. It's the next best thing to building your own car, because we use your order as our jig, so to speak.



Unless you're one of the purl-one-drop-three brigade, strike a blow for something or other. Pack up your raveled cares (in your old knit bag?), turn on a Tempest and make off with all the fun.

*Optional at extra cost

Wide-Track Pontiac Tempest

Pontiac Motor Division • General Motors Corporation



BOATS AND BOATING

- [Big Cat Island-Hops in Bahamas • 70](#)
- [Testing Lone Star Cruise Liner II • 100](#)
- [What's New in Boating • 174](#)

PHOTOGRAPHY

- [Cameras You Load Like a Gun • 112](#)
- [What's New in Photography • 172](#)
- [Photographically Speaking • 173](#)

HOME AND SHOP

- [A Kabob Rack for Your Barbecue • 99](#)
- [Lap-Honing Supersharp Edges • 105](#)
- [Tool Box Gets You off Your Feet • 106](#)
- [Custom-Building a Carrying Case • 107](#)
- [New Plastic-Mending Cements • 169](#)
- [What's New in Tools • 176](#)

ELECTRONICS

- [Heath Hi-Fi TV Kit • 96](#)
- [What's New in Electronics • 160](#)
- [Have Gun—Will Solder • 163](#)

AUTO REPAIRS

- [Hints from the Model Garage • 146](#)
- [Gus and the Mysterious Miss • 150](#)

PICTURE NEWS

- [Fish Research on a Floating Lab • 63](#)
- [Pedal-Power Plane Wins Degree • 65](#)
- [Cruiser Launches Three Missiles • 80](#)
- [Diving Robot Drills for Oil • 81](#)
- [Paraglider Lifeboat for Spacemen • 93](#)
- [Jet Car Burns Up Drag Strips • 94](#)
- [Floating Mower Chops Hyacinths • 95](#)

SHORT CUTS AND TIPS

- [Bolt Extends Reach of Wrench • 111](#)
- [Self-Propelled Raft Buoyed on Air • 116](#)
- [Gun Mount for Rifle Cleaning • 116](#)
- [Pedal Oscillates Sanding Drum • 158](#)

EVERY MONTH

- [PS Readers Talk Back • 6](#)
- [Science Newsfront • 23](#)
- [Getting Ahead • 36](#)
- [Detroit Report • 48](#)
- [90, 60, 30 Years Ago • 50](#)
- [I'd Like to See Them Make • 79](#)
- [New Ideas from the Inventors • 88](#)
- [Wordless Workshop • 114](#)
- [Shop Talk • 156](#)

PS readers talk back

45 Years Ago—in France

The 30-year-old item on new air brakes for planes ["90, 60, 30 Years Ago in PS," Jan.] tickled me. In 1918, I was test pilot at the Hanriot aircraft factory in France. Hanriot was building Spads, the Hanriot Pursuit (a nice little single-seat job), and a Sopwith nicknamed the Strutter (a two-seater biplane powered with a Le Rhone rotary engine).

While obsolete for use at the front, the Strutter was extensively used for training. It was a sweet little ship, but had a rather bad habit of shedding the wings if dived to terminal velocity.

Just outboard of the catwalk to the pilot's cockpit, on both lower wings, there was a section of the trailing edge of the wing that could be turned down so it was at a 90-degree angle from the line of flight. A large hand-wheel at right of the pilot operated these "air brakes." The flaps, as they're now called, were quite effective, shortening the landing run and takeoff by about 30 percent.

WILL T. SCOTT, Santee, Calif.

Warning for Amateur Gas Welders

"How to Get Started in Gas Welding" [Jan.], by John Burroughs, does a great disservice to gas welding and cutting. If there is one area where the home-workshop operator should be prohibited from welding, it is in his cellar workshop. In fact, any welding or cutting in a frame building should be prohibited unless under careful control of qualified personnel.

A. N. KUGLER, Chief Welding Eng.
Air Reduction Sales Co., NYC.

... The statement, "Take ordinary common-sense fire precautions and you can gas-weld in your basement with complete safety," is dangerous over-simplification. In industrial prac-





Winners' circle

Why racing "pros" prefer Perfect Circle rings—the piston rings to install for championship performance in any engine

Starting point to finish line—that's the toughest trip an engine can take. To maintain full-power performance, racing "pros" take extra care in picking engine parts. Their choice in piston rings: Perfect Circle.

PC-equipped cars have won 28 of the past 35 races at Indianapolis. Year after year, more major USAC events and NASCAR competitions are won by drivers using PC rings than any other piston ring brand.

The Perfect Circle piston rings that racing "pros" use are the *same* off-the-shelf rings you can install for championship engine performance in your car. They are *not* specially-made for racing. What does make them special is their lasting precision fit and long-life dependability in any engine.

The next time you install rings—or have them installed, be sure to stop oil loss through valve guides by installing Perfect Circle Valve Seals, too.

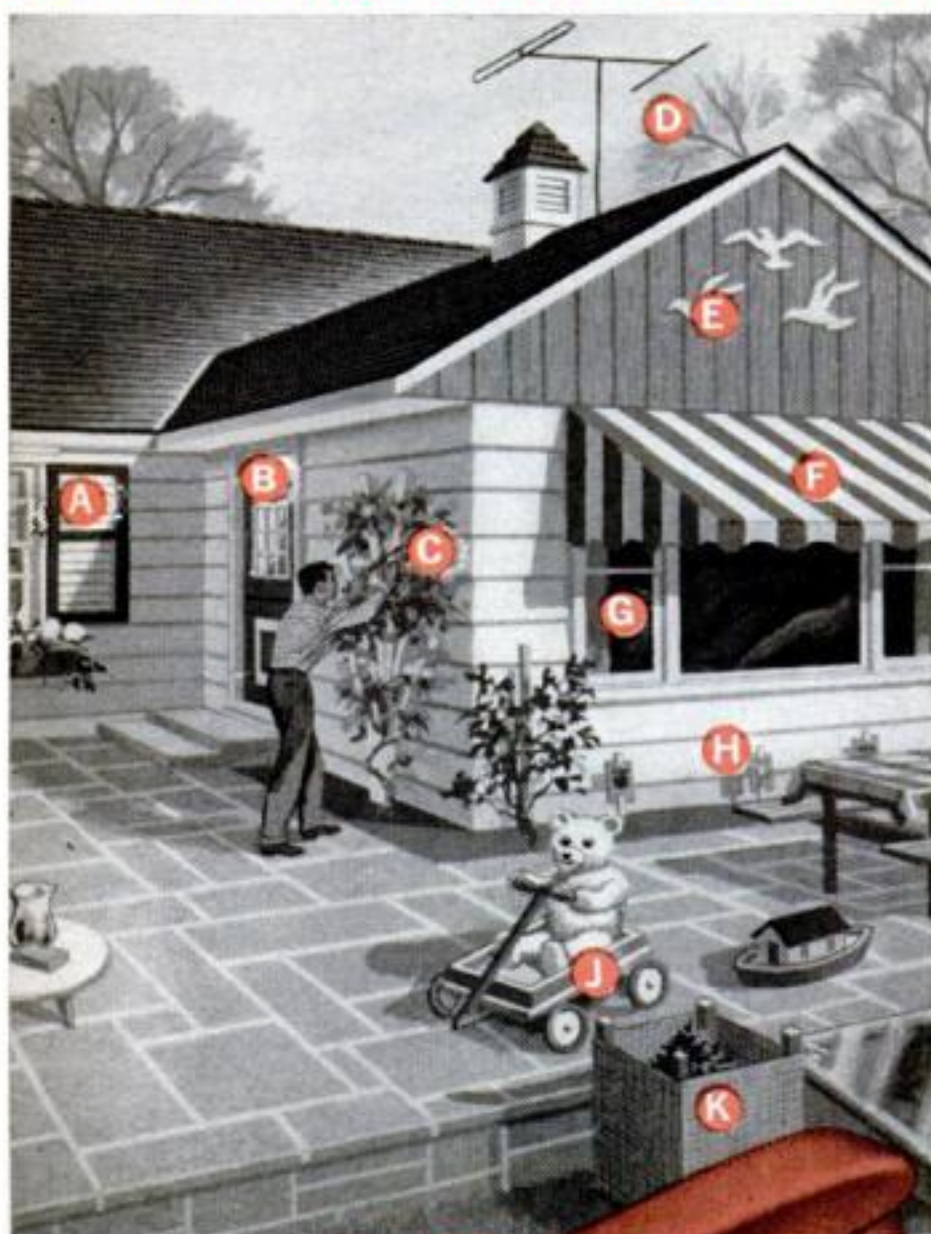


PERFECT CIRCLE

**PISTON RINGS • CYLINDER LINERS • PRECISION CASTINGS
TURBINE BLADES AND WHEELS • ELECTRONIC PROGRAMING EQUIPMENT
SPEED CONTROLS • HAGERSTOWN, INDIANA**

Plants and Subsidiaries: HAGERSTOWN, RICHMOND, NEW CASTLE, TIPTON AND RUSHVILLE, INDIANA
THE PERFECT CIRCLE COMPANY, LTD., DON MILLS, ONTARIO, CANADA • SCHELLENS TRUE CORPORATION, IVORYTON, CONNECTICUT • PERFECT CIRCLE INTERNATIONAL, FT. WAYNE, INDIANA • PERFECT CIRCLE HOLLAND N.V., THE HAGUE, NETHERLANDS • Factories, Affiliates and Licensees in MEXICO, ARGENTINA, AUSTRALIA, BRAZIL AND FRANCE

Do it all easily, quickly with a SWINGLINE STAPLE GUN



ONLY
\$4⁹⁵



- Push-button loading
- Built-in extractor
- Handle lock
- Rugged, heavy-duty steel construction
- Load indicator
- Open channel takes 2 staple sizes: 1/4" and 5/16"
- At better hardware, department, stationery stores

A Swingline Staple Gun makes immediately possible—and easy—all those time-consuming, hard-to-do chores both inside and outside your home.

(A) Repairing shutter slats (B) Weatherstripping (C) Fastening plants, vines to trellis (D) Television antenna wire (E) Outdoor decorations (F) Awnings (G) Screening (H) Markers for seeding (J) Repairing toys (K) Burlap covers

FREE! Send for booklet on how to do many stapling jobs.

Swingline INC.
Long Island City 1, N.Y.

World's Largest Manufacturer of Staplers for Home and Office

8 POPULAR SCIENCE MAY 1963

tice, moving or protecting combustibles within 35 feet is recommended.

F. R. FETHERSTON,
Compressed Gas Assn., Inc., NYC.

Offbeat Recordings

In "This Is Hi-Fi?" [Mar.] you say that one man mounted his mikes alongside the tracks to record the sound of a steam locomotive. On the next page you show a picture suggesting that the most exciting train effects are obtained



by placing the microphones a considerable distance away. I'm confused.

JOHN WESCOTT, Philadelphia.

The long-distance method is a specialty of O. Winston Link, one of the foremost contributors to this field of sound recording. Link has produced five albums of "Sounds of Steam Railroading" (Railway Productions, 58 E. 34 St., NYC 16) working with real, live operating railroads. The photo shows Link in action with his star performer.

Helium—the Maverick

In "Sky-High and Starry-Eyed" [Feb.] you say that any gas experiences a sharp temperature drop when expanded. This is true except for one provision: The temperature of the gas initially must be below its inversion temperature. The inversion temperature of helium and hydrogen is well below ordinary temperatures, so the gas would actually heat up upon expansion. If it was initially at its inversion temperature, no change in temperature will occur.

LAURIE FORBES, Edmonton, Can.

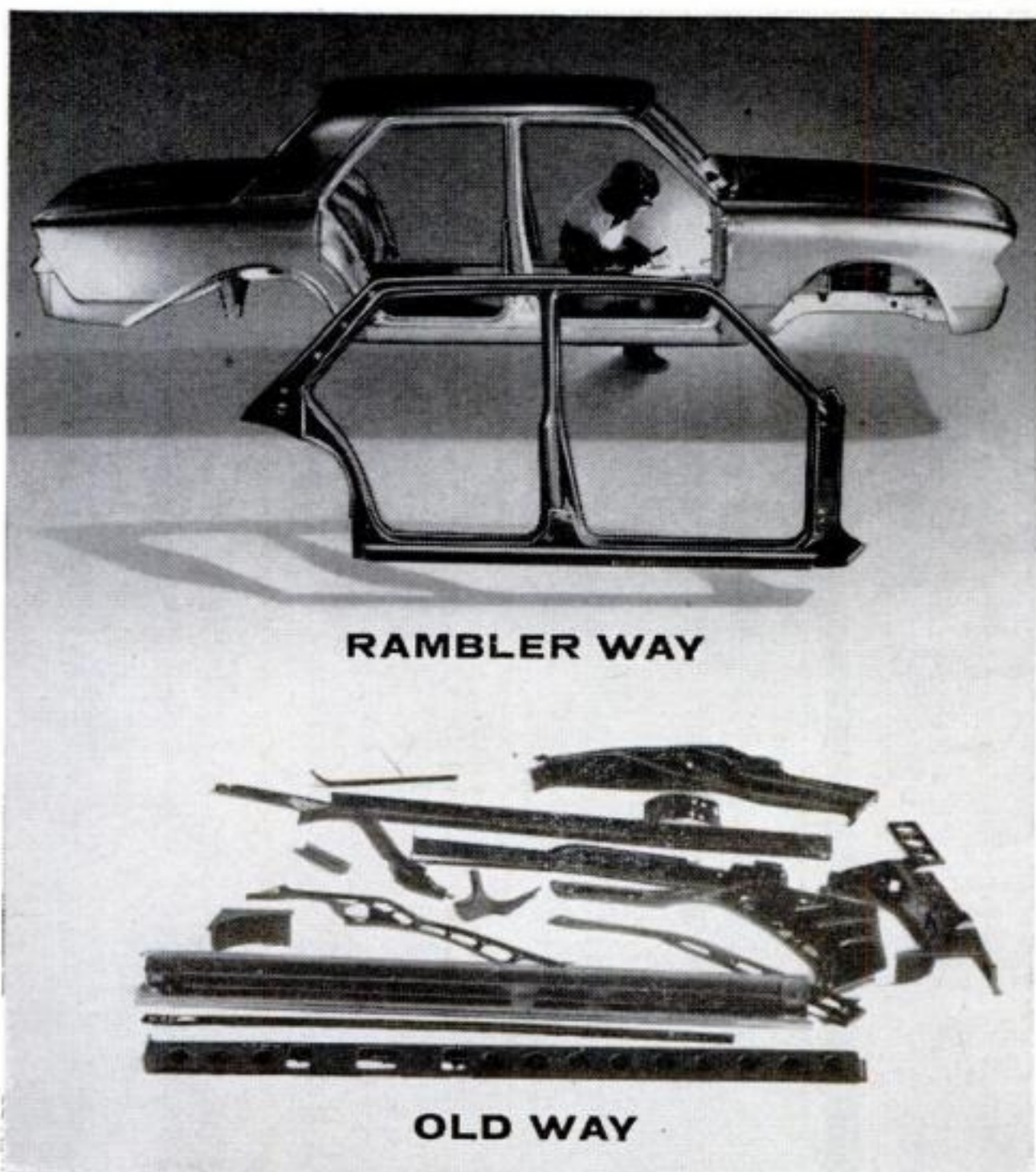
According to an expert at the Linde Co., this is true of hydrogen, within certain limits, but not of helium. So there is a temperature drop.

Rooftop Camper

Thought you might like to see our "sleeper," built last year from PS [May '61] plans. We

CONTINUED

FROM RAMBLER—A YEARS-AHEAD BREAKTHROUGH:



RAMBLER WAY

OLD WAY

NEW ADVANCED UNIT CONSTRUCTION OBSOLETE'S "JIGSAW" BODY BUILDING

Rambler forms the outer and inner side panels of each car—the uniside structure—from massive, one-piece steel stampings. Eliminated: up to 50 separate small parts still pieced together by other car makers.

This solid uniside structure is the key to new Advanced Unit Construction, the sensational breakthrough creating new '63 Classic Six, V-8 and Ambassador V-8 models that are the strongest, tightest, most rattle-free ever built.

See Rambler '63—"Car of the Year"—at your Rambler dealer!

Look at the advantages of new Advanced Unit Construction!



You get more than enough head-room for six 6-footers in a car that's nearly 3 inches lower.



You get in and out easily because curved glass side windows let your doors curve right up into the roof.



You get a car that looks longer but isn't—is actually easier than ever to park and handle.

RAMBLER '63

Winner of
Motor Trend Magazine
Award:

"CAR OF THE YEAR"



HIGH WAGES

**for operators of
heavy construction equipment**

... here's your opportunity to be a part of the biggest booming industry in the U. S. A. ... National's actual field training teaches you how!

NOW is the time for you to learn to be an Operating Engineer for big diesel-engined bulldozers, draglines, cranes, back-hoes, scrapers and motorgraders!

Cash in on the training you'll get at National for years to come. The construction field is going up, up, up ... heavy equipment operators today are making as much as \$10,000 a year and more! You can make a career out of it ... and the best part of all is that you need no experience to start. National School trains you right from the beginning.

National is NOT a correspondence school ... qualified job-experienced instructors teach you in person on over ¼ million dollars worth of School-owned modern diesel-engined machines of the same type now in use by the industry. Full 220-hr. and 440-hr. courses. VA approved. Ages 17-56. Payment plans available. Full-time Job Advisory and Counselling Director for the exclusive benefit of graduates.



GRADUATES REPORT ...

New Yorker, on a project in South, says:

"... job will take at least a year to complete ... my accomplishments changed me from a \$60-a-week man to a \$150 to \$350-a-week man."

Jon E. Oppenheim
Great Neck, N. Y.



California graduate reports:

"... a new contract gives 83¢ an hr. raise over the next three years; now getting \$4.53½ an hr. ... also paid holidays."

Paul Van Wettering
Van Nuys, Calif.

Eight years ago, I founded National School of Heavy Equipment Operation, the first school of its kind in the world. Since then, students from all 50 states and 28 foreign countries have been enrolled at National, and now hundreds of graduates are working in the construction field for higher wages than they ever made before!

Gilbert S. Shaw
President and Founder



Decide NOW to train for high wages and job security as a Heavy Equipment Operator. Mail coupon TODAY for FREE illustrated School Catalog. No obligation. (Even if you are taking a course in heavy equipment operation — write for our catalog and compare your training with ours.)

NATIONAL SCHOOL of HEAVY EQUIPMENT OPERATION
Dept. A-37 P. O. Drawer 1686, Charlotte, N. C.
Please send me FREE illustrated school catalog and complete information without obligation about how I can become an operator.

Name _____ Age _____

Address _____

City _____ Zone _____ State _____

built it oversize (5'-by-9' base inside 1"-by-12" sides) to cover the steel carrier bars. It takes a full-size spring mattress and leaves plenty of storage space. Because we turned to our scrap pile, major costs were \$9 for waterproof canvas and \$13 for the carrier bars.



We used our sleeper on a 2,900-mile vacation trip last year. Many people expressed interest in the setup. We have hopes for more good times this year.

W. M. HOLDER JR., Roswell, N.M.

For 1963 "Vacationing on Wheels" plans, see the special section starting on page 117.

Where Is the F-104?

"The Incredible X-15" [Feb.] carries a caption below the lead photograph that says one can see an "F-104 chase plane in the distance." The photograph shows three aircraft. One is the X-15, one is a B-52, and the other is an F-100. These are the only aircraft I can see. Where is the F-104?

JOHN M. KRIES, Denver.

That one got away. You're correct, the aircraft shown is an F-100 Super Sabre.

Dyeing Aluminum Rainbow Colors

Readers interested in "How to Anodize Aluminum" [Feb.] can get all the acid they need at about the right strength and without cost from gas stations or anywhere car batteries are sold. The acid in trade-ins is eventually dumped. A hydrometer is convenient for removing and collecting the acid in a plastic bleach bottle, and for checking the gravity — you may need to add distilled water. A reading of 1,100 corresponds to 14.35 percent by weight, very close to the 15 percent the article suggests.

A table giving the hydrometer reading for any desired percentage solution of sulfuric acid will be found in the "Handbook of Chemistry and Physics of the Chemical Rubber Co."

ARTHUR MILES, San Diego, Calif.

Back to the Races

Keith Vining's references to average speeds of the Indianapolis 500 and the Daytona 500 ["Detroit Goes Back to the Races," Feb.] are

CONTINUED

Your home away from home...

Wherever You Go!

It's nice to know that, wherever you go, you have "a friend in town" . . . the Harley-Davidson dealer. Stop in for a chat; for directions; for service; for answers to your questions about motorcycle performance; or for information about local motorcycling activities. You'll find the Harley-Davidson dealer is genuinely interested in you . . . that his unmatched motorcycling know-how and the very best in service

are yours for the asking. Stop in soon. Let your Harley-Davidson dealer round out your riding pleasure with this exclusive combination:

8 basic motorcycle models ➤ Choice of power, styles, colors ➤ Hundreds of special accessories ➤ The snappiest scooter on wheels ➤ Smartly styled clothing ➤ Countless mechanical options ➤ Service and parts ➤ Unmatched experience.



HARLEY-DAVIDSON
MOTOR CO., MILWAUKEE 1, WISCONSIN



"I have installed Amber-Lite lens conversion in my car. Be smart, be safe and bring your car up to date too!"

Bob Cousy

BOB COUSY

BE SAFE . . . BRING YOUR CAR UP-TO-DATE NOW!

- AMBER COLOR TURN SIGNALS HAVE BEEN RECOMMENDED BY THE SOCIETY OF AUTOMOTIVE ENGINEERS (S.A.E.) AND ARE STANDARD ON ALL 1963 MODELS.
- AMAZING LOW PRICE FOR COMPLETE **AMBER** LENS CONVERSION KIT FOR THE TURN SIGNALS ON YOUR CAR!

only \$1.00 per set

- CONVERT YOUR OLD FASHIONED WHITE DIRECTIONAL SIGNALS NOW TO NEW, SAFER, AMBER COLOR.
- **AMBER-LITE** CONVERSION IS NOW AVAILABLE FOR ALL U.S. CARS 1955-1962 AND FOR ALL YEARS AND MODELS OF VOLKSWAGENS.
- EASY TO INSTALL IN A FEW MINUTES!

FREE!

AMBER-LITE PS-563

will ship 4 CONVERSION SETS to you for the price of 3. You get a set for one car absolutely FREE!

AMBER-LITE

P.O. BOX 62
BOSTON 32, MASS.

GENTLEMEN: I enclose \$..... for.....sets for the following car(s):

MAKE YEAR
MAKE YEAR
MAKE YEAR
MAKE YEAR

PLEASE RUSH MY ORDER TO:

NAME
STREET
CITY STATE

AMBER-LITE Pays Postage and Handling.

misleading. The Indy track's turns (laid out in 1909) are not mathematically banked, making it difficult to negotiate them. Still, Parnelli Jones broke the one-lap and four-lap qualifying records in 1962 with an average of 150.3 m.p.h. The highest speeds reached on the track are around 180 m.p.h. at the end of the backstretch.

TOM BURCH, Indianapolis.

Junior Johnson of Ronda, N.C., drove a '63 Chevrolet one lap at Daytona on Feb. 21 at 168.6 m.p.h., and Tiny Lund in a '63 Ford averaged 151.6 m.p.h. for 500 miles there on Feb. 24, despite the fact that 35 miles were run under the caution flag.

They're Studying Curves

Your picture of the parabolic building at the Los Angeles airport [Feb., p. 95] was brought



in to my math class by one of the students. I was pleased that you mentioned the curve used. This particular article appeared just as we were studying quadratic curves and their relation to the conic sections. It made good illustrative material for our bulletin board.

R. E. KOHMAN, Wellsville, N.Y.

Fixing a Fouled Rocker-Arm Oil Line

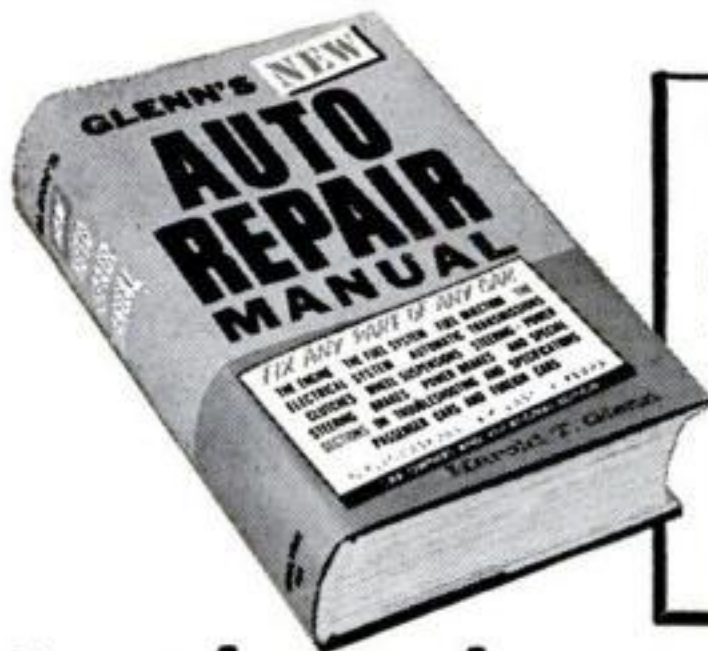
In your handy "Hints from the Model Garage" [Feb.], there's one on running a line from the oil filter to the head. I have found that a copper oil line with an elbow fitting into the head works much better than a flex line. The flex line has a tendency to crack where it bends to go into the head block, and also makes for a fuller oil flow.

ROBERT B. RYAN, Torrance, Calif.

First Giz—Homemade?

"Now . . . Automatic Turning for Your Lathe," [Feb.] would give the impression that the Giz is new. I made one of these in '23 or '24. It worked so well that one of my neighbors borrowed it and I haven't seen it since. The only difference was that I made mine for less than \$25.

J. VAN CANNEYT SR., Danbury, Wis.



GLENN'S NEW AUTO REPAIR MANUAL 1963 Edition

FIX THESE CARS:

Avanti	Chevy II	De Soto	Lancer	Pontiac
American	Chrysler	Dodge	Lincoln	Rambler
Buick	Comet	Fairlane	Mercury	Studebaker
Cadillac	Corvair	Falcon	Meteor	Tempest
Checker	Corvette	Ford	Oldsmobile	Thunderbird
Chevrolet	Dart	Imperial	Plymouth	Valiant

• COMPLETE SPECIFICATIONS ON ALL MODELS FOR PAST 11 YEARS • 1052 Pages • What tools to use . . . Chassis, electrical, power accessory diagrams . . . Quick on-the-car repair procedures . . . AND MUCH MORE! **\$9.95**

These two brand-new manuals show you **How to fix any car made anywhere!**

U.S. or foreign . . . Full-size or compact . . . Right up to 1963!



GLENN'S BRAND-NEW FOREIGN CAR REPAIR MANUAL

FIX THESE CARS:

Alfa Romeo	DKW	Lancia	NSU Prinz	Simca
Austin	Datsun	Lloyd	Opel	Singer
Austin-Healy	Fiat	Mercedes	Peugeot	Sunbeam
BMW	Ford	Benz	Porsche	Triumph
Borgward	(Foreign)	Metropolitan	Renault	Toyopet
Citroen	Hillman	M.G.	Rover	Vauxhall
DAF	Humber	Morris	Saab	Volkswagen
Daimler	Jaguar	Magnette	Sabra	Volvo

• COMPLETE SPECIFICATIONS IN METERS & INCHES • Engine design differences • Servicing of all European carburetors: S.U. Solex, Zenith, Weber, Bosch Diesel and Fuel Injectors • Lucas, Bosch, and Marelli electrical equipment • Wiring diagrams of all models . . . AND MUCH MORE!

➡ SPECIAL FEATURE: factory-approved racing modifications for sports-car models! **\$17.50**

WHETHER it's a Cadillac or a Volkswagen, a Dodge or a Datsun—whether it was made in Detroit or in any country that ships cars to America—one of these two books will show you exactly how to fix it.

**Over 3000 pictures in each . . .
Every Step Simplified**

Every auto repair or adjustment in these giant GLENN'S manuals is broken down into simple, numbered steps. And every step is illustrated with action-type photos or drawings that let you see how it's done.

There are thousands of clear photos of mechanical parts . . . diagrams . . . exploded views. You get detailed troubleshooting charts—to find the trouble pronto—and full HEADLIGHT-TO-TAILLIGHT REPAIR INSTRUCTIONS.

You learn how to disassemble any part of the car . . . inspect it . . . clean it . . . repair it . . . and reinstall it on the car.

Whether you're a professional mechanic or just working on your first car, these are books that will pay for themselves many times over!

Seven-day FREE trial

We are so sure that these are the handiest, most helpful auto repair manuals in existence that we will gladly let you try either one or both of them for 7 days FREE. Then you can either return them and owe nothing, or pay for any that you keep in easy installments.

Write Chilton Co., Dept. PS-53, 525 Locust St., Phila. 6, Pa. Wherever books are sold, or use convenient coupon.

SEND NO MONEY

CHILTON COMPANY, Dept. PS-53
525 Locust St., Philadelphia 6, Pa.

Please send me the GLENN'S Manual(s) I have checked below for 7 days' FREE examination. I will then remit purchase price plus postage in three installments as specified below. Otherwise, I will return Manual(s) postpaid and owe nothing.

☐ GLENN'S NEW AUTO REPAIR MANUAL, 1963 Edition \$9.95

(Installments: \$4.00 in 7 days; \$3.00 a month later; \$2.95 plus 45¢ postage a month after that)

☐ GLENN'S FOREIGN CAR REPAIR MANUAL \$17.50

(Installments: \$6.00 in 7 days; \$6.00 a month later; \$5.50 plus 45¢ postage a month after that)

Name.....Age....

Address.....

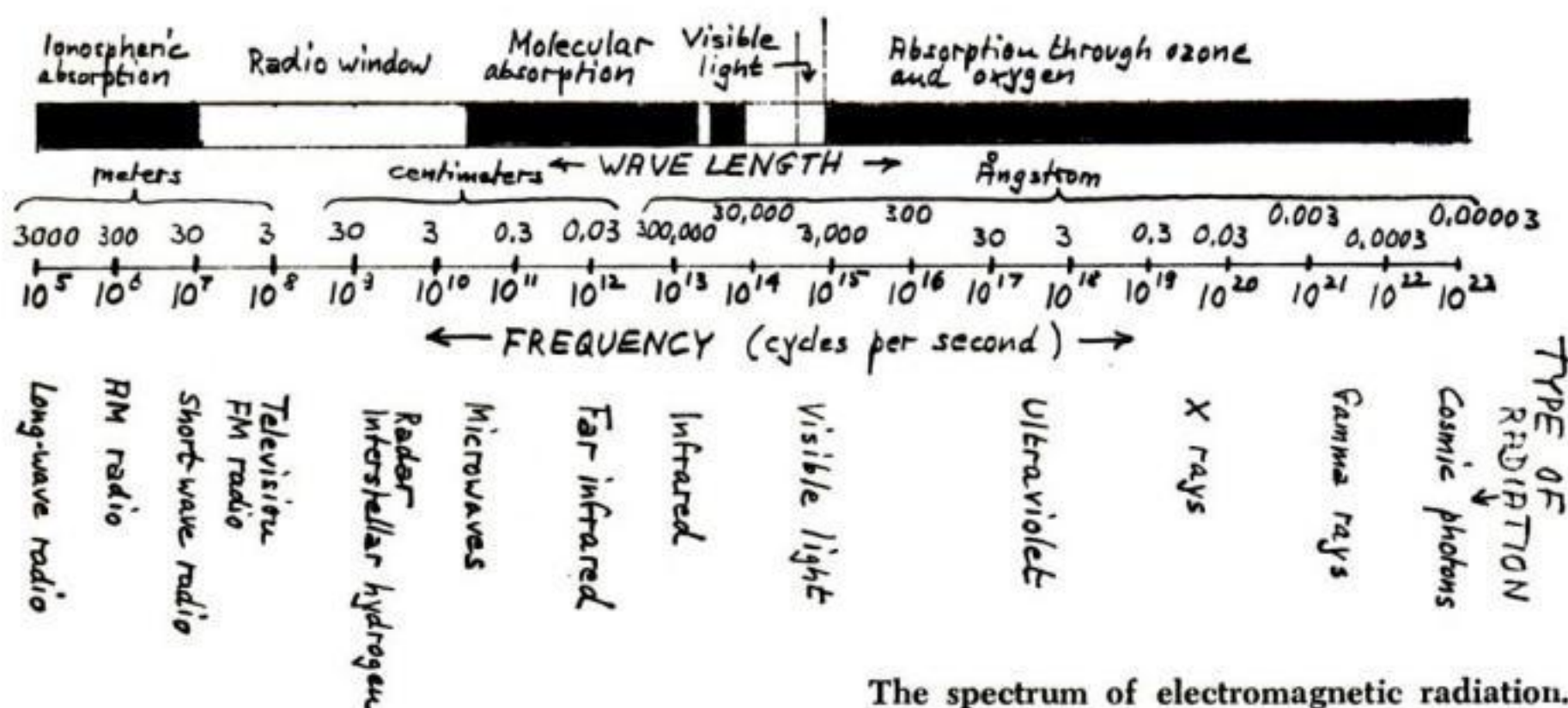
City.....Zone...State.....

☐ SAVE. Enclose price of Manual(s) now and publisher pays all postage and handling charges. Same return guarantee.



Dr. von Braun (right) confers with Harrison Storms Jr., chief of Apollo project at North American Aviation.

Dr. Wernher von Braun Answers Your Questions About Observatories in Space



The spectrum of electromagnetic radiation.

Q Why are space vehicles used to study extraterrestrial radiation?

A Radiation from stars, nebulae, and distant galaxies provides the only clue to understanding them.

Outer space is pervaded by their entire spectrum of electromagnetic radiation, shown in my diagram. It ranges in wave length all the way from 0.00003 Angstrom (an Angstrom is one ten-billionth of a meter) up to 3,000 meters. The corresponding frequencies also are shown in the diagram.

But we live at the bottom of a dense atmosphere that absorbs most of this radiation, and so is opaque to it. Only a small portion penetrates to the earth's surface. In essence, our atmospheric shell provides only two "windows": one

for visible light (with wave lengths of 4,000 to 8,000 Angstroms) and a bit of the infrared, and the other for radio waves (between about one centimeter and 30 meters in wave length).

For centuries, astronomical observations of celestial objects were limited to the narrow window admitting visible light. In recent years, radio telescopes have opened the "radio window" and gleaned much new information.

Space vehicles, operating outside the earth's atmosphere, can observe the *entire* spectrum of electromagnetic radiation. Manned or unmanned, they offer an ideal platform for studying the universe, with radiation-sensitive instruments that cannot be used on earth. Even a casual glance at the little diagram shows that these new observational



What does it take to feel like a man?

It takes *action* to feel like a man. Takes *pride*, too, and good, skillful *training*. Join the modern Army's Combat Arms program and you'll have all three.

Pride? In Combat Arms it makes no difference whether you select Infantry, Armor, or Artillery. You'll be proud of any one of them. And you'll end up proud of yourself, too.

Action? In today's modern Army it's *go* all the way. Every unit is smooth, fast, and flexible. And every day brings fresh, new challenges. It takes real men to cope with them.

Training? In today's world nothing but skilled hands and minds will do. The whole Army is like a huge, well-oiled engine—with men and machines closely interlocked. It takes *men* to fit into this kind of picture. And the Army *makes* men like this—technically skilled, competent, confident.

If you qualify you can receive extensive training in other areas like: missiles, motor mechanics, electronics, engineering—or any of 150 other fields. Find out how to feel like a man in today's fast-changing world. See your local Army recruiter today!

tools are bound to multiply our knowledge of the universe.

Q *What practical use can we foresee for such studies?*

A We expect plenty.

Nothing is more difficult to predict than the profitable applications of a new discovery. But in the last analysis, all the things that fill our everyday needs—the food we eat, the clothes we wear, the automobiles we drive—are the result of someone's desire to explore the unknown. The harnessing of nuclear power, whether in the atom bomb or in a power-generating reactor, can be traced back directly to astrophysical studies—of the sun, in particular.

We should always bear in mind that all plant and animal life on earth would be extinct within a few hours if the sun suddenly ceased to shine.

A better understanding of the mechanism of energy transfer from the sun to the earth will undoubtedly lead to a better understanding of everyday problems down here on earth.

Q *What are we trying to learn from solar radiation?*

A The sun is our most powerful source of stellar radiation. We can consider it the nearest fixed star. Because of the window problem, we still know very little about solar ultraviolet and X-ray radiation. But what little we have learned so far from artificial satellites clearly indicates that some of the previous ideas held by astrophysicists—particularly about the intensity of ultraviolet emissions of hot stars—have been woefully wrong.

We are still completely in the dark about the causes of the sun's mysterious 11-year sunspot cycle. Scientists have known for years that there is a close correlation between this sunspot cycle and the earth's magnetic variations and polar lights. The discovery of the Van Allen belt has provided some clues for the mechanism of this interaction. But

we simply do not know what causes the sun to "breathe" in that cycle.

Conceivably, part of the heat energy continuously released by the huge nuclear reactor operating in the sun's interior, instead of flowing evenly outward to the surface, may be dammed up in some fashion so that it comes through in rather gentle periodic surges.

Variable stars with great changes in brightness are quite common in the universe—and it is fortunate indeed that our own sun's cyclic variations are so small that 100 years ago it was not even known they existed. They went undetected for so long primarily because the sunspot cycle is not accompanied by any noticeable variation in visual brightness—in other words, as observed by visible light.

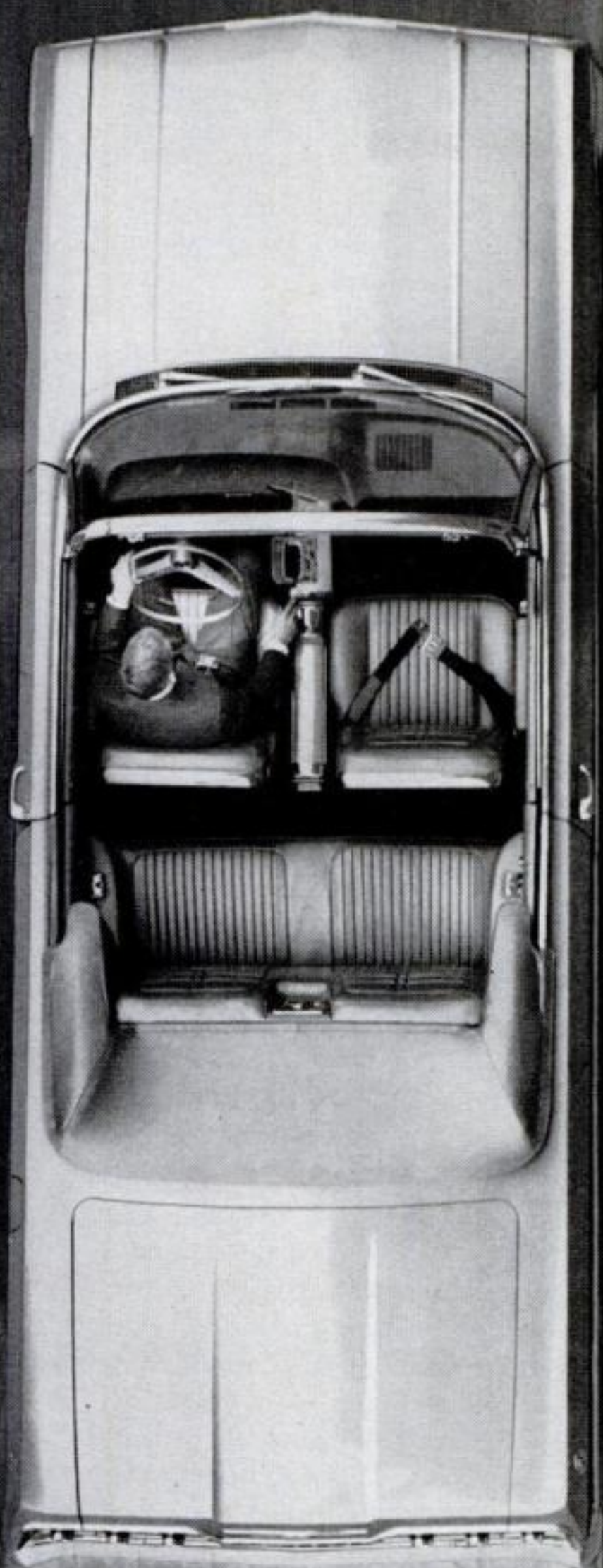
It can be expected that in the hitherto inaccessible ultraviolet region, very noticeable fluctuations will be recorded.

NASA's orbiting solar observatories will be equipped to record such radiation data. But for results we must be a bit patient. We'll have to wait for the length of at least one 11-year cycle.

Q *Is there any connection between the sunspot cycle and the weather?*

A Yes. Meteorologists have learned, to their dismay, that the statistical accuracy of their predictions is adversely affected by increased ultraviolet radiation from the sun.

The reason for this is easy to understand: The art of weather forecasting is based upon the principle of causality. In other words, the U. S. weather map for Tuesday is a direct logical deduction from the trends depicted on the weather map for Monday. But such cause-and-effect reasoning is permissible only as long as one analyzes a "closed system," such as an atmosphere subjected solely to internal disturbances, while exposed to a steady, unvarying influx of solar radiation. As soon as the situation is altered by external factors—such as unrecognized changes in solar ultraviolet radiation—the beautiful causal



CHEVROLET IMPALA SUPER SPORT CONVERTIBLE

SPIRIT LIFTER

If you'd like to get away from it all, and who wouldn't, this Chevrolet will take you farther, fancier, than anything else we can think of. Take an Impala Convertible like the one shown, or, if a hard top is more to your taste, take an Impala Sport Coupe. Then add the optional-at-extra-cost Super Sport stuff: contoured bucket seats in front, special coil springs at all four wheels, distinctive wheel covers and special SS identification. If this isn't enough to make you want to take tomorrow off, there's more. Additional extra-cost options include a four-speed stick shift or floor-shift Powerglide, heavy-duty shocks for better handling, seat belts for safety, Positraction for better bite, an electric tachometer to help you keep an eye on the standard 195 horsepower V8 or optional V8's from 250 to 300, 340, 400 and up to 425 eager horses. Once your dealer has delivered your Chevy, with goodies on it, you'll never again have to put up with anybody else's wild tales about performance. You'll be driving a Chevrolet, old friend. That's the one they invented the word for!

Chevrolet Division of General Motors, Detroit 2, Michigan



The make more people depend on

NEW AEC 77 TRANSISTORIZED ELECTRONIC IGNITION

Increases engine power up to 10% . . . assures fast starts at low rpm . . . full power at high rpm . . . up to 20% more mpg . . . prevents fouled plugs . . . increases spark plug life 3 to 5 times over normal . . . insures 75,000 mile breaker point life gives instant starting in sub-zero weather . . . eliminates frequent tune-ups . . . simple 30 minute installation by anyone.



In conventional ignitions, high voltage at the spark plugs falls off from 28,000 volts to 13,000 volts as engine speeds increase. The result is a weak spark causing incomplete combustion, fouled plugs, loss of engine power, and poor gas mileage. AEC 77 Transistor ignition increases and maintains high voltage at 30,000 volts, guaranteeing a strong hot spark to deliver full engine power beyond 10,000 rpm, with up to 20% more miles per gallon.

**WORLD CHAMPION RACING DRIVER,
PHIL HILL, USES AEC 77 . . .**

"AEC 77's strong spark can make up for worn points and spark plugs. It will make your car run smoother at low speeds, and appreciably improve its performance and economy."



AEC 77's use General Motors Delco type 2N1100, high voltage, 15 ampere transistors, and Motorola type 1N2836B, 50 watt zener diodes . . . while others use two low voltage transistors in series with two 1 watt zener diodes, that can cause synchronization problems and premature failures. Every Transistor 77 (400:1) Ignition Coil is epoxy-oil impregnated and hermetically sealed for maximum insulation and cooling, while others use inferior tar filled coils that cannot handle the power loads AEC 77 delivers.

Proven in over 2,000,000 miles of testing, AEC 77 is so dependable in performance, design, and engineering, that every unit is registered and guaranteed for 3 full years.

COMPLETE DO IT YOURSELF KIT!

AEC K4 . . . Negative ground only . . . \$32.95

NEED COILS AND BALLAST RESISTORS ONLY?

Transistor 77 (400:1) Ignition Coil . . . \$11.95

Ballast Resistor (.5 ohm-90 watt) . . . \$ 1.25

COMPLETE FACTORY WIRED UNITS!

AEC 77 with Transistor 77 Ignition Coil 6/12 V . . . \$39.95



FREE Transistor Tune-up Meter available only from Automotive Electronics Co. . . . at no extra cost . . . with every AEC 77 system ordered.

—ORDER NOW—

Please add 75c for postage and handling
AEC, 387 Park Avenue South, N.Y.C. 16, N. Y.

AUTOMOTIVE ELECTRONICS CO.
387 Park Ave. South, N. Y. 16, N. Y.

PS-5

NAME.....

ADDRESS.....

CITY.....ZONE.....STATE.....

☐ AEC-77 For Negative ground cars 6/12v \$39.95

☐ AEC-77P For Positive ground cars 6/12v \$59.95

☐ K4 Kit \$32.95 ☐ 400:1 Coil \$11.95 ☐ Ballast \$1.25

☐ FREE BROCHURE on AEC units

reasoning falls apart, and the results of weather predictions become disappointing.

Today there is no operational, round-the-clock, satellite-borne recording system for solar ultraviolet radiation. But within a few years we shall have it. Along with making a continuous survey of the atmosphere's ozone layer (which goes up to 60-mile altitude and can be reached with simple rocket probes), it will enable meteorologists to pin down exactly those external influences on our weather. Tiros and Nimbus-type satellites with their TV cameras will keep a watchful eye on the earth's ever-changing cloud patterns, too.

Once all these new sources of knowledge are tied in with the existing weather stations, by a rapid-fire global communications system, we can rightfully expect weather forecasting to reach new heights of accuracy.

Q What is cosmic radiation?

A The term cosmic radiation, or cosmic rays, is used for elementary particles that crisscross outer space at velocities approaching the speed of light.

The majority of these particles are protons, the nuclei of atoms of hydrogen (atomic weight, 1). But heavier nuclei up to those of indium (atomic weight, 114.8) have been detected. By and large, the particle count diminishes with increasing particle weight, but some heavier elements such as iron (atomic weight, 55.8) are relatively abundant. Although evidence is still a bit sketchy, some scientists believe that the atomic-weight distribution of cosmic rays reflects the relative abundance of the chemical elements throughout the universe.

This has led to the theory that cosmic rays might be the debris of tremendous thermonuclear explosions of stars. Such exploding stars have been observed by astronomers and are called *supernovae*.

However, some cosmic-ray particles travel so fast that even a supernova explosion could not account for their en-



FOR A BETTER JOB WITH BETTER PAY

LEARN ELECTRONICS AT HOME

Choose from these complete up-to-date courses

- Radio and Electronic Fundamentals
- TV Servicing • Color TV
- Communications Electronics

- FCC License Preparation
- Mobile Communications
- Electronic Drafting
- Automation Electronics
- Computer Programming • Transistors

Each lesson a complete training package! Practical application begins with your first lesson — you get prime quality equipment as required to keep and use on the job. Courses for beginners and advanced students.

Voluntary Tuition Plan — pay for each lesson only when you order it! You never have to pay for the whole course if you don't complete it; courses can be interrupted at any time you wish — resumed later!

Approved for veterans.

SEND FOR THIS FREE BOOK NOW!

64-PAGES OF CAREER IDEAS IN ELECTRONICS!



RCA INSTITUTES, INC.
A Service of Radio Corporation of America
The Most Trusted Name in Electronics

Resident School Courses in New York City and Los Angeles offer comprehensive training in Television and Electronics. Day and Evening classes start four times each year. Detailed information on request.

RCA INSTITUTES, INC. Home Study School, Dept. PS-53
350 West Fourth Street, New York 14, N. Y.

Rush me the FREE 64-page illustrated booklet "Your Career in Electronics" describing your electronic home study training program. No salesmen will call.

Name Age.....

Address.....

City..... Zone..... State.....

CANADIANS — Take advantage of these same RCA courses at no additional cost. No postage, no customs, no delay. Send coupon to: RCA Victor Co., Ltd., 5581 Royalmount Ave., Montreal 9, Quebec.

GUNK® removes grease
-- scourfully!
cleans -- degreases -- freshens



- power mowers • engines
 - cement floors • kitchen walls • ovens • exhaust ducts
 - paint brushes • furnace filters • barbecue grills
 - implements • machinery
- AT AUTO SUPPLY, FARM & HARDWARE STORES!**

GUNK CHICAGO CO., River Forest, Illinois
serving the Midwest and Southwest
RADIATOR SPECIALTY CO., Charlotte, N.C.
serving the East, Southeast and far West



Build this 'Walkie-Talkie'

and 108 other kits radios, hi-fi, ham-gear test instruments

it's easy with EICO

FREE CATALOG—MAIL COUPON

EICO Electronic Instrument Co., Inc.
3300 Northern Blvd., L.I.C. 1, N.Y.

send free catalog and name of local dealer

NAME AGE PS-5

ADDRESS

CITY ZONE STATE

NEW

MFG CAR TOP-FISHERMAN



NEW TRIHEDRAL HULL — Provides greater stability, maximum maneuverability. Takes you through rough water comfortably.

ONE-PIECE FIBER GLASS CONSTRUCTION — No rivets to pop, no screws to replace, no sealing, no caulking, freedom from rot, corrosion. No metallic noise.

EASILY TRANSPORTABLE

WEIGHT APPROX. 110 LBS.

For further information write



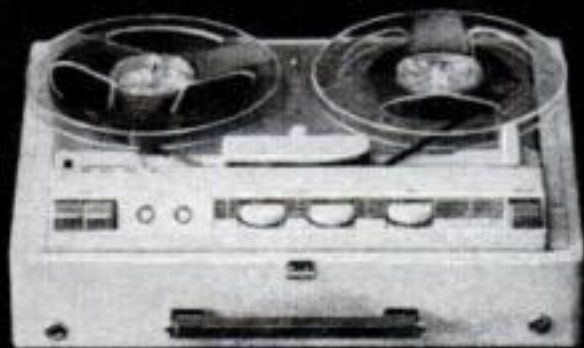
MFG MOLDED FIBER GLASS BOAT COMPANY
83 Fourth Avenue, Union City, Pennsylvania

LOW, LOW PRICE

\$197⁰⁰

F.O.B. Union City

**new
Sony**



for portable use*

STERECORDER 464-D



for custom installation

**only
\$199.50**

both stereo recording & stereo playback!

An unprecedented price for the famed Sony quality! The long-awaited Sony Sterecorder 464-D—dual purpose, dual performance! Dual performance means both 4 track stereo **recording** and 4 track stereo **playback**. Dual purpose means custom component installation **and** portable use. Recording and playback pre-amps are **built-in**, and such features as sound on sound, language and music training, two speeds, push button track selection and Sony precision engineering make this the most outstanding tape recorder value at \$199.50. ■ All Sony Sterecorders are Multiplex-ready!

*Carrying case optional

For literature or name of nearest dealer, write
Superscope, Inc., Dept: 26, Sun Valley, California

SUPERSCOPE

The Tapeway to Stereo

ergy. It is believed such high-energy particles derive their extra speed from being bounced back and forth, between the magnetic fields that accompany vast, moving interstellar clouds of extremely tenuous ionized gas or *plasma*.

Cosmic radiation of a lesser energy level is known to come from the sun, particularly during solar flares. Such lower-energy particles approaching the earth are deflected, by the earth's magnetic field, toward the North and South Poles. Thus, total cosmic-ray intensity is at a minimum over the earth's equator.

Cosmic-ray particles as encountered in outer space are often called *primaries*, to distinguish them from the cascade of secondary particles generated by their collision with air nuclei in the upper layers of our atmospheric shell. These secondary particles shower down through the atmosphere. Although their intensity tapers off with decreasing altitude, they can be detected at the ground and even several hundred feet under water.

The question of the physiological hazards of cosmic radiation to astronauts is still hotly debated. Surprisingly, radiologists are not concerned about the most energetic primary particles. These go through the human body so fast that they have no time to do damage.

The greatest potential hazard is posed by a slow, heavy primary that comes to a "screeching halt" in the human body. In this case the positively charged primary particle has time enough to jerk a whole string of electrons out of the atomic shells of the body tissue, along the path of its "terminal retardation," or final braking. Some radiologists believe that certain areas of the human body, such as the brain and spinal cord, might be endangered by extensive exposure to such "slow-down hits." Hence they are advocating extra radiation protection for longer space flights. ■ ■

.....

Dr. von Braun will consider answering questions from readers of **POPULAR SCIENCE** in the magazine, but he cannot undertake to answer each one by mail. Letters to him should be addressed in care of **POPULAR SCIENCE**, 355 Lexington Ave., New York 17, N. Y.

LOOKING FOR EXTRA COMFORT AND LONGER WEAR?

KINNEY

STALWARTS

with

NEOPRENE SOLES!



Better Things for Better Living ... through Chemistry

Kinney "STALWARTS" combine dress oxford styling with ruggedness for long wear and on-the-job comfort.

Toe-to-heel cushioned insoles, cushion side-arch supports are features of Kinney "STALWARTS" that make a big hit with men whose work is tough on shoes.

Soles and heels of long-wearing Du Pont Neoprene provide another "plus" ... long service life that means more wear for the money. Neoprene resists oil, grease, chemicals and cold-weather cracking ... helps ease you through your working day because of its lasting resilience. Du Pont, Dept. PS-5-NS, Wilmington 98, Delaware.

Available at 580 Kinney shoe stores coast to coast

CUBA?

History reports itself while it is happening, in English, from the Caribbean ... Moscow ... New Delhi ... London ... Laos ... Little America ... and very soon, the Moon. Be there tonight on a hallicrafters.



Model WR-1500
WORLD RANGE RADIO
professional communication receiver
for short wave and local broadcast

For 64-pg. miniature book, "Guide to Short Wave Listening," send 35¢ to Dept. 17-E.

hallicrafters

5th & Kostner Aves., Chicago 24, Ill.

MOWER TIRES SMOOTH?

Restore full traction with


Replace-a-Treads

With Replace-a-Treads you can restore original traction power to worn-out, slipping power mower tires ... at less than half the cost of new tires or wheels. Installed quickly, simply, without removing mower wheels. Complete instructions on package. Fits all standard tires from 8½" to 11" dia. ... treads up to 1⅞" wide ... reel type power and hand mowers.

Tough tread gives long wear!

Made of same tough tread rubber used in passenger tires. Outlasts original mower tires by far. Won't leave black marks on walks or drives. Only \$3.95 a pair at your favorite hardware store, garden center, mower repair shop or service station.

TPA-2003

only \$3.95 a pair 



The Gates Rubber Company 999 South Broadway
Denver 17, Colorado

GET READY FOR THE SPACE and SCIENCE ERA! SEE SATELLITES, MOON ROCKETS CLOSE-UP



AMAZING SCIENCE BUYS

for FUN, STUDY or PROFIT



See the Stars, Moon, Planets Close Up! 3" ASTRONOMICAL REFLECTING TELESCOPE

SEE AND PHOTOGRAPH SUN'S ECLIPSE JULY 20TH
Be visually safe and use Edmund's Combination Sun Projection
Screen and Camera Holder.
Stock No. 70,162-N\$9.95 Postpaid

60 to 180 Power—Famous Mt. Palomar Type! An Unusual Buy!



Assembled—Ready to use! You'll see the Rings of Saturn, the fascinating planet, Mars, huge craters on the Moon, Phases of Venus, Star Clusters, Moons of Jupiter in detail. Galaxies! Equatorial mount with lock on both axes. Aluminized and overcoated 3" diameter high-speed f/10 mirror. Telescope comes equipped with a 60X eyepiece and a mounted Barlow Lens, giving you 60 to 180 power. Low-cost accessory eyepiece available for higher powers. An Optical Finder Telescope, always so essential, is also included. Sturdy, hardwood, portable tripod. FREE with Scope.

—Valuable **STAR CHART** plus 272 page "**HANDBOOK OF HEAVENS**" plus "**HOW TO USE YOUR TELESCOPE**" BOOK.
Stock No. 85,050-N\$29.95 Postpaid

4 1/4" Astronomical Reflector Telescope!

255 Power. New Vibration-Free Metal Pedestal Mount.
Stock No. 85,105-N\$79.50 F.O.B.



WAR SURPLUS! American-Made! 7x50 BINOCULARS

Big saving! Brand new! Crystal clear viewing—7 power. Every optical element is coated. An excellent night glass—the size recommended for satellite viewing. Individual eye focus. Exit pupil 7 mm. Approx. field at 1,000 yds. is 376 ft. Carrying case included. American 7 x 50's normally cost \$274.50. Our war surplus price saves you real money.

Stock No. 1544-Nonly \$74.80 pstpd. (tax included)
6 x 30 Binoculars—similar to above and a terrific bargain.
Stock No. 963-N\$33.00 pstpd. (Tax included)

'FISH' WITH A WAR SURPLUS MAGNET Go Treasure Hunting On The Bottom

Great idea! Fascinating fun and sometimes tremendously profitable! Tie a line to our 5-lb. Magnet—drop it overboard in bay, river, lake or ocean. Troll it along the bottom—your "treasure" haul can be outboard motors, anchors, fishing tackle, all kinds of metal valuables. 5-lb. Magnet is war surplus—Alnico V Type—Gov't. Cost, \$50. Lifts over 125 lbs. on land—much greater weights under water. Order now and try this new sport.



Stock No. 70,571-N 5 lb. Magnet\$12.50 Postpaid
Stock No. 70,570-N 3 1/2 lb. size\$8.75 Postpaid
Stock No. 85,152-N 15 lb. size, lifts 250 lbs.\$33.60 FOB

SOLAR CELL SET HARNESSES POWER OF THE SUN



Conduct spell-binding experiments, experience endless fascination in converting sunlight into electricity to power small motors, amplifiers, make light meters, densitometers, burglar alarms, etc. Used experimentally to drive cars, power boats. Low price set includes SILICON SOLAR CELL and SUN BATTERY (produces .2 to .45V 10-16 millamps).

SELENIUM SOLAR PHOTOCELL (lower power) and 112-page Handbook of Projects, demonstrations, experiments, etc. Also incl. CADMIUM SULPHIDE PHOTO CONDUCTIVE CELL (light sensitive resistor) which generates electricity to turn lights on in the evening, open doors, count traffic, etc., etc.
Stock No. 60,291-N\$7.95 Postpaid



MINIATURE WATER PUMP

Wonderful for experiments, miniature waterfalls, fountains, HO gage railroad backdrops, etc. Tiny (2 1/2" x 1 1/4") electric motor and pump ideal for hobbyists, labs, schools. Pumps continuous flow of water at rate of one pint per minute at a 12" head. With 2 D Batteries in series will pump to 24" high. Runs 48 hrs. on battery. Works in either direction. Self-priming. Stock No. 50,345-N\$2.25 Postpaid

MAIL COUPON for FREE CATALOG "N"

NEW! 1000's of Bargains—164 Pages
EDMUND SCIENTIFIC CO., Barrington, N.J.
Please rush Free Giant Catalog-N.

Name.....
Address.....
City.....Zone.....State.....



Exciting New Color Experiments . . . FABULOUS DIFFRACTION GRATING REPLICA KIT

See Nov. "Popular Science" Article Featuring This
Wonder Material in Christmas Lighting Projects.



This amazing material breaks up white light into deep, rich hues. Sparkles with all the color of the spectrum. Comes alive with the flashing brilliance of rainbow magic. Now you can create spectacular color-coordinated effects and decorations—inside & out—convert old, unwanted earrings, cufflinks, pendants, etc., into beautiful, iridescent pieces of jewelry. Real conversation piece, too. Kit contains 8 1/2" x 5 1/2" sheets of see-through (transmission) and reflecting type grating, mounted circular grating, unmounted transmission and reflecting types, round pieces of mounting, double-faced mounting tape, stereo viewer, and Edmund Diff. Grating Idea Book.

Stock No. 70,563-N\$5.00 Postpaid

TRANSMISSION TYPE (you see through it)

Stock No. 40,267-N 8" x 11" sheet\$1.50 Pstpd.
Stock No. 50,180-N 8" x 6 ft. sheet5.95 Pstpd.

REFLECTING TYPE (reflects spectrum)

Stock No. 50,201-N 8" x 11" sheet\$2.50 Pstpd.
Stock No. 50,203-N 8" x 6 ft. sheet10.95 Pstpd.

WOODEN SOLID PUZZLES



12 Different puzzles that will stimulate your ability to think and reason. Here is a fascinating assortment of wood puzzles that will provide hours of pleasure. Twelve different puzzles, animals and geometric forms to take apart and reassemble, give a chance for all the family, young or old, to test skill, patience, and, best of all to stimulate ability to think and reason while having lots of fun. Order yours now.

Stock No. 70,205-N\$3.00 Postpaid



OPAQUE PROJECTOR

Projects illustrations up to 3" x 3 1/2" and enlarges them to 35" x 30" if screen is 6 1/2 ft. from projector; larger pictures if screen is further away. No film or negatives needed. Projects charts, diagrams, pictures, photos, lettering in full color or black-and-white. Operates on 115 volt, A.C. current, 6-ft. extension cord and plug included. Operates on 60 watt bulb, not included. Size 12" x 8" x 4 1/2" wide. Weight 1 lb., 2 oz. Plastic case with built-in handle.

Stock No. 70,199-N\$7.95 Postpaid

LARGE SIZE OPAQUE PROJECTOR

Ideal for photographers, this low-cost unit projects 3 1/2 ft. sq. image at 6 ft.—7 1/4 ft. sq. image at 12 ft. Projects photos, drawings, sketches, clippings, any opaque copy up to 6" x 6"—larger pieces in sections. Lenses are 2 plano-convex, 3 1/2" dia. mounted in 5 1/4" barrel. Projector is 11 1/2" high, 13 1/4" wide, 9" front to back, pressed steel in black wrinkle finish, bakelite handle. Uses two 200 watt bulbs—not included. Complete with side platform to hold illustrations, 6 ft. elec. cord, heat resist. white glass mirror.



Stock No. 80,066-N\$42.00 Postpaid



BUILD A SOLAR ENERGY FURNACE

A fascinating new field. Build your own Solar Furnace for experimentation—many practical uses. Easy! Inexpensive! Use scrapwood! We furnish instructions. This sun powered furnace will generate terrific heat—2000° to 3000°. Fuses enamel to metal. Sets paper aflame in seconds. Use our Fresnel Lens—14" diameter . . . f.l. 14".

Stock No. 70,130-NFresnel Lens.....\$6.00 Postpaid
11" SQ. FRESNEL LENS F.L. 19"SLIGHT SECOND

Stock No. 70,533-N\$4.75 Ppd.



ASTRO-COMPASS AND TRANSIT

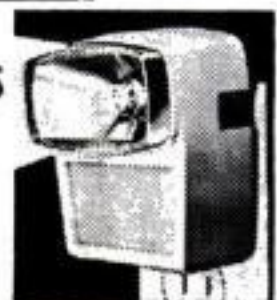
War surplus! Astro Compass alone cost Govt. \$75. We have added a Sighting Level to improve versatility. Hundreds of uses in carpentry, brick laying, foundation work, grading, irrigation or drainage. Much below cost of ordinary surveying instruments. Ideal for do-it-yourselfers. 10 1/4" high, 6" long, 4" wide. Adjustable leveling platform—2 spirit levels for aligning—also spirit level in sighting attachment. A tremendous bargain.

Stock No. 70,267-N\$19.95 Postpaid

EMERGENCY LIGHT GOES ON AUTOMATICALLY WHEN POWER FAILS

Every plant, office, shop needs "Life Lite". Just plug into wall socket. Electroluminescent panel serves as night light, but when power fails for any reason, powerful bulb lights to give bright "Stand-by" service. Can also be used as a rechargeable flashlight.

Stock No. 60,276-N\$14.95 Postpaid



ORDER BY STOCK NUMBER. SEND CHECK OR MONEY ORDER. SATISFACTION GUARANTEED.
EDMUND SCIENTIFIC CO., BARRINGTON, N. J.

Science newsfront

BY WALLACE CLOUD

A monthly report: What's going on in science and why it's important to you

SPACE

What did we learn about Venus?

The lead article in POPULAR SCIENCE last December was "Keeping a Date with Venus," a report on the U. S. interplanetary probe Mariner 2, then approaching its destination. Mariner kept its date on December 14 and scanned Venus with instruments designed to see through the planet's blanket of clouds. Then came months of waiting, as the data was deciphered and released piecemeal.

What sort of place is Venus? Even with the results in, the experts disagreed about their meaning. After consulting scientists at NASA's Institute for Space Studies, Harvard University, and the Lamont Geological Observatory, we tried our own hand at working out a picture of conditions on Venus. Our version, illustrated by artist Ray Pioch, is at the right.

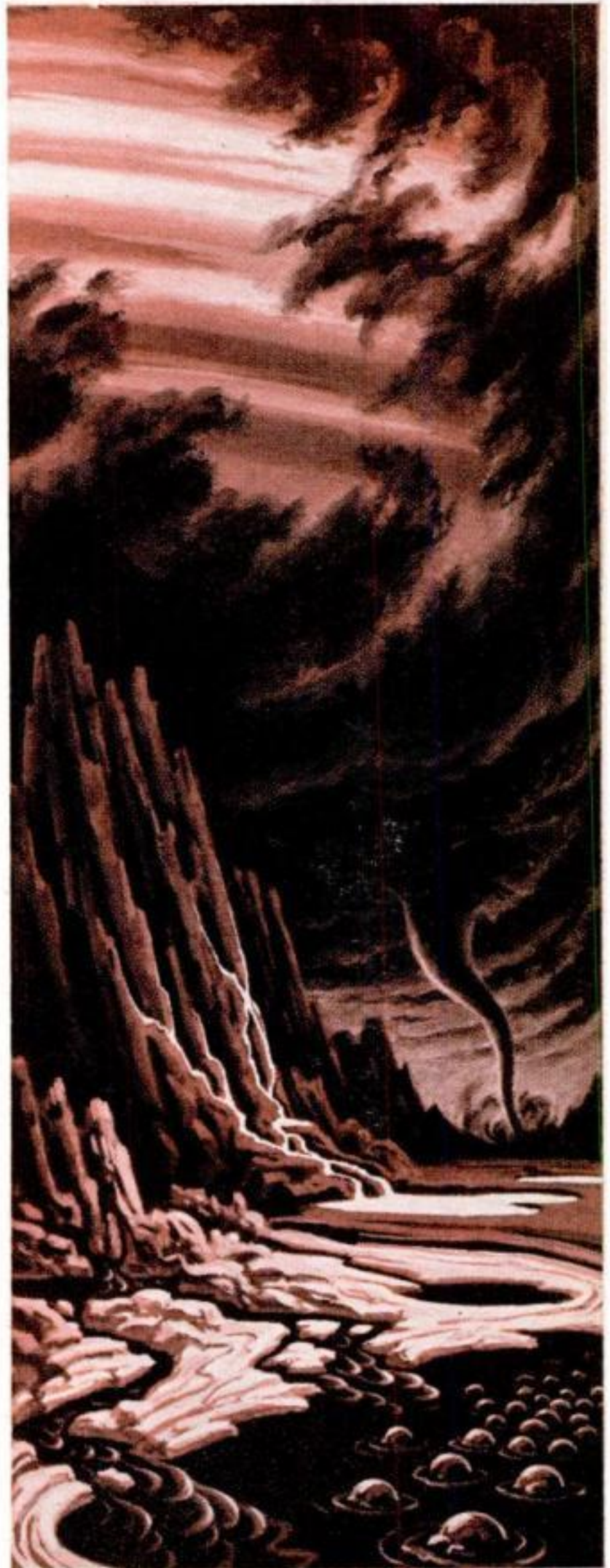
Beneath its perpetual heavy overcast—consisting of two cloud layers, 25 and 40 miles up—Venus is a searing furnace.

The sun, if it is ever visible through breaks in the clouds, is brick red; the sky is yellowish green. These colors result from the great density of the atmosphere (which may be largely carbon dioxide)—pressure at the surface is somewhere between 10 and 50 times that of our atmosphere.

Even at that pressure, there can be no liquid water, since the temperature is about 900 degrees F. on the sunlit side—so hot the rocks may glow feebly with the beginnings of red heat—and is near 700 degrees on the dark side.

But there may be other liquids. The temperature is above the melting point of lead. Perhaps molten soft metals and molten salts ooze from the rocks. Heavy hydrocarbons somewhat like asphalt may also exist in liquid form.

These would vaporize to form the lower cloud layer, which may be an oily, smoky smog consisting of hydrocarbons and their oxidation products (in which the planet's free oxygen was locked up long ago).



CONTINUED

50¢ and this COUPON

Oxford Studio 44 (P29) BROMFIELD ST.
BOSTON 8, MASS.

Please send me complete 20 SECTION PROGRAM.

NAME _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

Sorry, no C.O.D. orders accepted. Money-back guarantee.

☐ 50¢ Program
☐ \$1.00 with Home Gym

Is All That Stands Between You and the Most Incredible Offer in the Entire Physical Culture World

KARATE JUDO

HERE'S YOUR POWER PACKED 20 SECTION PROGRAM!

- ★ Section 1. **KARATE COURSE.** Deadliest form of attack or defense. Samurai Suicide Warriors methods can turn you into an arsenal of fighting power. Master secret paralyzing chops and blows.
- ★ Section 2. **JUDO COURSE.** Oriental self defense, a multitude of throws and simple techniques to cut an attacker to ribbons.
- ★ Section 3. **SAVATE FOOT FIGHTING.** Actual photographs of French foot fighters in action showing fearsome underworld methods.
- ★ Section 4. **SECRETS OF YOGA.** Shows exercises and ancient methods of physical and mental culture as practiced for 2,000 years in the Far East.
- ★ Section 5. **STRONG MAN STUNTS.** How to perform dazzling, skillful feats and beach and gym acrobatics. Put on your own show.
- ★ Section 6. **HANDBALANCING.** How to perform intricate balancing stunts, including the fabulous one-hand-stand which will impress your friends.
- ★ Section 7. **COMPLETE BOXING PROGRAM.** Secrets gathered from the roughest, toughest pros. Learn two-fisted machine-gun attacks & terrifying fighting.
- ★ Section 8. **ALL-IN WRESTLING.** Key holds, throws and locks used by the world's toughest wrestlers, more devastating than boxing.
- ★ Section 9. **MUSCLE-BUILDING COURSE.** Created by champions from all over the world. Build arms, legs, back, chest, neck & development to the limit.
- ★ Section 10. **WEIGHTLIFTING.** Showing the routine used by Mr. America, Mr. World & Mr. Universe. Builds massive power and rugged strength.
- ★ Section 11. **SECRETS OF ENDURANCE.** Develop power-house endurance and tremendous energy. Have untiring stamina and explosive resistance.
- ★ Section 12. **MAKING WEAPONS OF YOUR HANDS.** How to strengthen every fibre & sinew in your wrists & hands making them devastating, lethal weapons.
- ★ Section 13. **NERVE CENTER CHART.** 21 vital spots on the human body which protects you from a kill-crazy attacker, gun slinger or knife carrier.
- ★ Section 14. **KEEP FIT PROGRAM.** An entire revolutionary method of keeping fit using only a chinning bar. Up-to-the-minute scientific method.
- ★ Section 15. **DEVELOPING CRUSHING POWER.** Ingenious method develops pulverizing power in your arms by using the "Power twist."
- ★ Section 16. **CHEST-PULL COURSE.** Special exercises for improving your swimming, baseball, football, basketball, athletics, tennis, etc.
- ★ Section 17. **STIRRUP EXERCISES.** A "must" for the bodybuilder who demands the most in muscular definition gained from continuous resistance.
- ★ Section 18. **TENSION-FLEX EXERCISES.** Which develop pep, vigor, red-blooded vitality and leave you tingling with energy & dynamic power.
- ★ Section 19. **HEALTH EXERCISES.** Develop a rock-solid, punch-proof midsection and perfect glowing health and vitality.
- ★ Section 20. **FAMOUS KARATE PRACTICE DUMMY.** The life-like exclusive "K-MAN" designed for practicing lunges, chops, blows and feints.

PHYSICAL FITNESS BODY BUILDING, YOGA, BOXING WEIGHT LIFTING COURSES

With over A QUARTER OF A MILLION students in over FORTY countries in the world, OXFORD STUDIO, for twenty-six years has reigned supreme with prices remaining at a record low and instructions which are the most up-to-date in the world. All the courses have been created by Champions, not just American Champions, but Champions from as far away as Australia, India, Germany, France, England and South Africa. This 20 SECTION PROGRAM may be followed by everybody! Thin, fat, young, old, the busy executive, the tradesman, the white collar worker, athletes —EVERYBODY! After TWENTY-SIX YEARS STEADY, PROGRESSIVE GROWTH, OXFORD STUDIO'S courses represent astounding value, and the spectacular new scientific shortcuts to Karate attack and Judo defense are excelled only by the wonder-working methods of the physical culture courses.

A MOUNTAIN OF PRIVATE HOME STUDY COURSES—

50¢

YOU GET THE LOT!

YES! You get EVERYTHING, the whole package for just 50¢! Not just one course but 20 SPECIFIC, DETAILED, PICTURE-PACKED SECTIONS, revealing the latest scientific methods to assure success. Hundreds of dollars worth of vital information is packed into this program, you get super wall charts, hundreds of illustrations which can be understood by everyone. The low price is possible only because we eliminated all the frills, color printing and fancy leather binding.

Oxford Studio
44 (P29) BROMFIELD ST.
BOSTON 8, MASS.

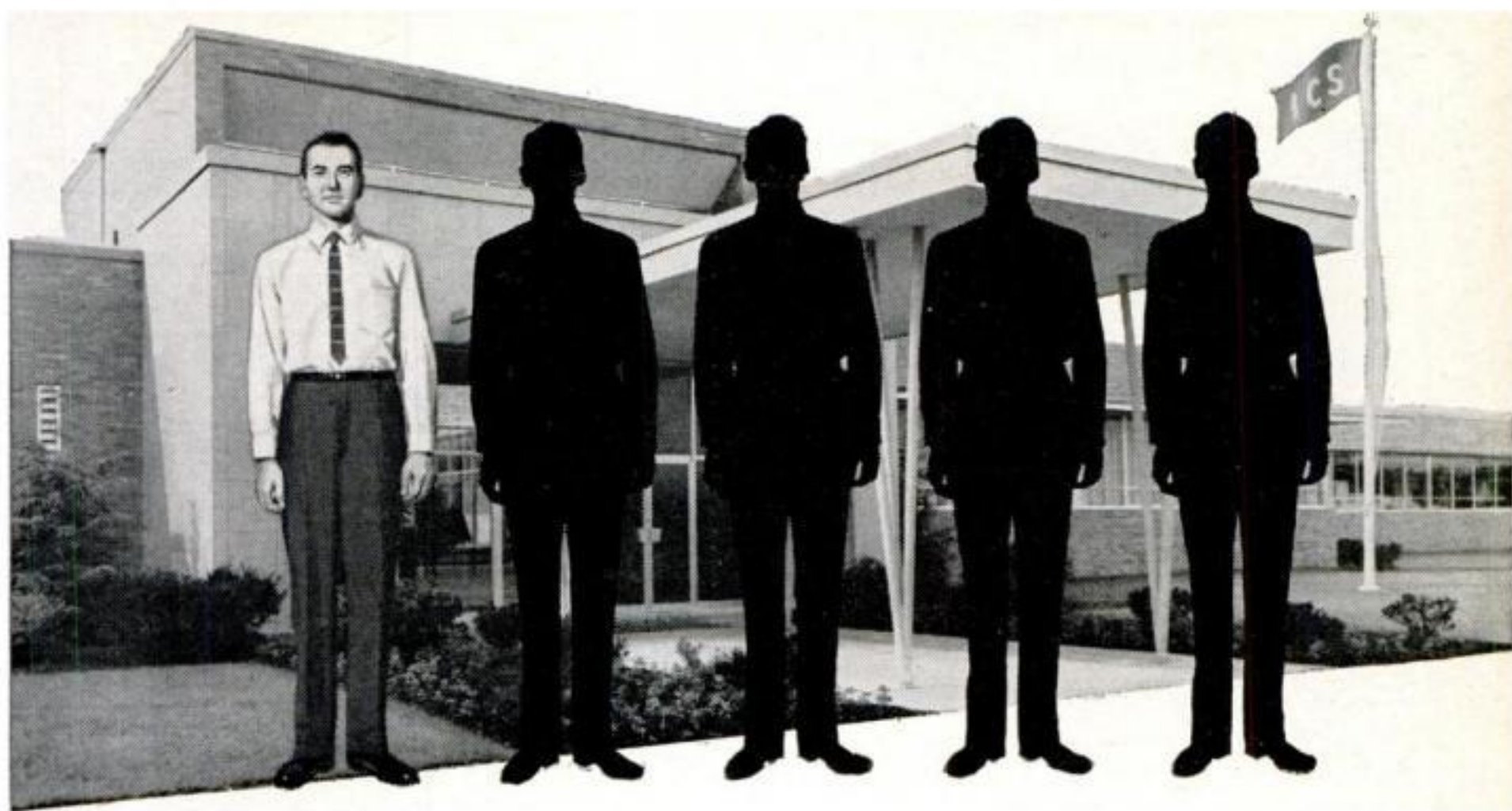


ORDER WITH CONFIDENCE by Mail. You can enjoy the same advantages as those attending an expensive gym.

UNPRECEDENTED BONUS OFFER

HOME GYM PLANS
Build All Your Own Gym Equipment, rowing machine, vault horse, parallel bars and a dozen others. Convert a basement, garage, etc. into a gym. NOW 50¢ with order. TOTAL \$1.00 complete.





World-famous I. C. S. Headquarters,
employing 600 full-time staff members

HERE'S REAL OPPORTUNITY— for the 1 Man in 5 Who's Determined to Get Ahead!

We all want to succeed in life—to make more money and afford the many good things that money can buy. You do, or you wouldn't be reading this.

But the fact is, only about one person in every five actually *does* anything about getting ahead. The others are content to plod along in the same old rut—always dreaming, but never really trying for the better jobs and bigger pay that could be theirs.

Which group are *you* in?

Depending on your answer, I. C. S. can help you move up *fast* by providing the specialized training that sets you apart from fellow workers. There are more than 250 I. C. S. courses to choose from, covering all of today's most rewarding job categories. Easy-to-follow texts, prepared by experts, let you apply what you learn right on the job—put you in line for advancement even *before* you win the famous I. C. S. diploma!

How about it? Right now is the time to prove that *you're* the one man in five who prizes success enough to achieve it. Mark and mail the handy prepaid post card. You'll receive, without cost or obligation, your personal Success Kit containing three valuable booklets: (1) "How to Succeed," (2) Opportunity catalog in your field of interest, (3) Sample I. C. S. study lesson. But don't put it off. Mail the post card (or coupon) this very *minute*!

INTERNATIONAL CORRESPONDENCE SCHOOLS

Dean's Office, Box B5751E, Scranton 15, Pa.

Please rush me my FREE Success Kit containing 3 valuable booklets, as outlined above!

Name _____ Age _____

Street _____

City _____ Zone _____ State _____

Field of Interest _____



AUTOMATIC "FREE STRIPPING" FLY REELS

Compare these features with any other automatic fly reel. You, too, will "Pick a Perrine."

- Choice of 10 models from \$6.95 to \$13.50
- Strips line easier than any other automatic fly reel
- No winding of spring during fishing, just strip the line
- No increased brake resistance when stripping
- Long spring retrieves up to 90 feet
- All models packed in re-useable styrene box
- All models fully guaranteed

"PICK A PERRINE" TODAY

at tackle counters everywhere



No tools needed for quick takedown and cleaning
For FREE attractive full color folder showing complete line of Perrine Fly Reels, Fly and Spin Boxes, write to —

ALADDIN LABORATORIES, INC.

620 South 8th Street • Minneapolis 4, Minnesota

Create . . . Your Own Business While Still Employed

While employed, double your income with YOUR OWN business. Free illustrated book tells you how other men do it. Then expand full time. Gross hourly profit: \$9 plus \$6 on each serviceman. Your income is unlimited.

Your service is nationally advertised. It's worldwide. Endorsed by McCall's and Parent's magazines.

Need no shop or experience. We'll teach and assist you. We'll finance you for all but a moderate down payment. Easy to learn . . . easy to do . . . quickly established.

We show you 15 proven ways to get customers.

G. F. Munroe, after 12 months, sold his business for 10 times his cost. Leo Lubel sold for \$7,116 above cost.

L. Babbit writes: "I average: \$400 monthly part-time. I'm starting full time." W. C. Smith: "Earned \$650 one week. Volume getting bigger." Ed. Kramsky: "In 2 years, have two assistants, a nice home and real security."

This may be your life opportunity. Find out today before someone else has your location. A postcard will bring full details and free book. No obligation. No salesman will call. Write TODAY before it's too late to get territory.

DURACLEAN CO., 3-185 Duraclean Bldg., Deerfield, Ill.

Science newsfront continued

The weather may be violent. If it rains, the rain would be oily, reaching the ground as hot mud after mixing with dust stirred up by high winds. Circulation of the atmosphere would be turbulent, due to the temperature range. The upper cloud layer,

Van Allen changes mind. The artificial radiation belt around the earth, created by last summer's U.S. H-bomb test high over the Pacific, is "very durable indeed" and may last "for a decade or so," concedes Dr. James A. Van Allen, discoverer of the earth's natural radiation belts. He has been involved in a controversy about the belt. In an interview published in this magazine last month, Dr. Van Allen held the position that the artificial belt would be undetectable by this summer, as he had predicted before the H-bomb test.

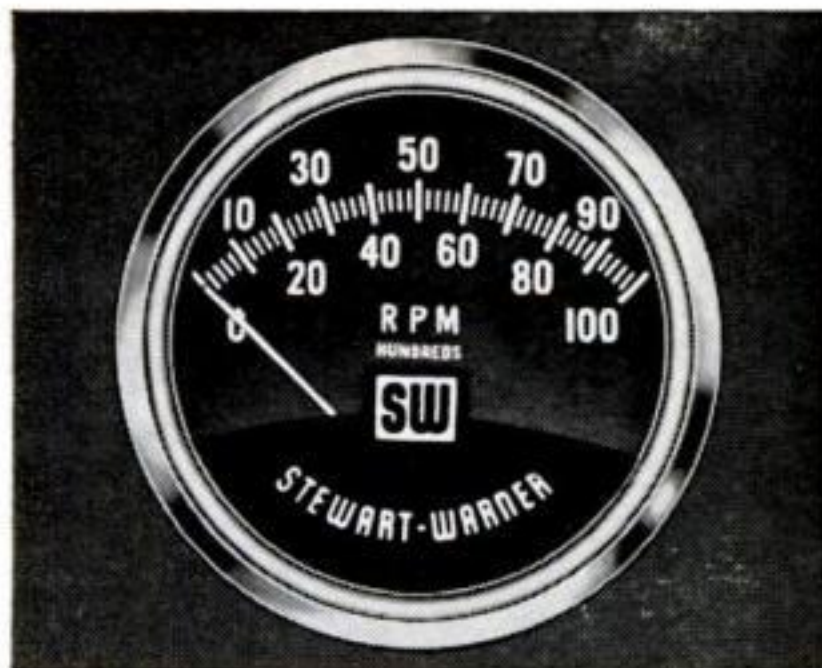
thought to consist of ice crystals and liquid droplets, has an outer temperature of about 60 degrees below zero, comparable to the temperature of the earth's upper atmosphere. Atmospheric circulation must also transport enough heat to account for the high temperature of the dark side, in view of the planet's slow rotation.

New information on the rotation of Venus came from radar experiments conducted during the time of the Mariner flight. Scientists at Jet Propulsion Laboratory found that the planet turns so slowly that it may always keep the same face toward the sun, or may even rotate *backwards* (in a direction counter to its orbital rotation) once every 250 earth days. That would make the sun rise in the west and set in the east roughly twice during a Venus year, which is equivalent to about 225 earth days.

Slow rotation explains one of Mariner's most important observations: absence of a detectable planetary magnetic field in space near Venus. Most physicists think the earth works like a dynamo; as it spins, electric currents are induced in the earth's liquid iron core, generating a magnetic field. So it's entirely logical that slowly turning Venus, also presumed to have a liquid core, has little or no magnetic field.

Lack of a magnetic field also checks out with Mariner's inability to detect any radiation belts around Venus, another contrast with our own planet. The earth's magnetic

for perfectionists!



A Stewart-Warner Tachometer can help you achieve an operating efficiency that just isn't possible with less sensitive tachs. With Stewart-Warner, rpm changes show up instantly. Accurately! Even at high speeds, there's no lag or overrun. You just "follow the needle" and set your shift pattern accordingly. You avoid over-revving and keep your engine operating in its most efficient rpm range. No guesswork about it!

Ask your dealer about the full line of Stewart-Warner Electrical and Mechanical Tachometers. Available in speed ranges to

10,000 rpm with segment and full sweep dials...2 $\frac{5}{8}$ " or 3 $\frac{3}{8}$ " diameter. All easy to read, designed to complement any dash. Make your choice today from the most complete line of automotive instruments in America. *Stewart-Warner!*



INSTRUMENT DIVISION
STEWART-WARNER
CORPORATION

Dept. D-53, 1840 Diversey Pkwy., Chicago 14, Illinois

NO JOB WORRIES

PLASTEX INDUSTRY needs manufacturers on small scale for big production of Lamps, Clock Stands, Art Goods, Novelties in Plastic Marble imitation. No Experience necessary. 1/2c material makes regular 10c store sellers. Moulds furnished for fast production. Small investment brings good profit. Big wholesale orders now being placed. Ambitious men have chance for real prosperity and job security. Our NEW FREE booklet will interest and benefit you.

PLASTEX INDUSTRIES, Dept. 2, 3400 Third Ave., New York 56, N. Y.

Shells are for turtles!

But, people need homes... designed for family living... even when traveling on weekends and vacations. Your family needs such Holiday Rambler features as space, comfort, convenience, practically no upkeep, and years of use. Write for free brochure.



HOLIDAY RAMBLER... 17 $\frac{1}{2}$ ft.
Other models for vacation or
retirement from 17 to 27 ft.

HOLIDAY RAMBLER

Dept. PS-5, Wakarusa, Indiana

EARN \$10,000 A YEAR

- | | |
|---------------------------------|--------------------------------------|
| <input type="checkbox"/> DIESEL | <input type="checkbox"/> ELECTRONICS |
| <input type="checkbox"/> AUTO | <input type="checkbox"/> AUTOMATION |

The average starting salary of students, completing our FCC License, Electronics Technician Course, and those completing our Diesel Automotive Training, is \$4,300 per year.

After becoming familiar with the industry, their salary usually increases to \$6,000 or \$7,000 per year.

After they become senior technicians, or master mechanics, they can earn \$8,000 to \$10,000 per year.

When they become specialists, or a part of management... or start their own business... they can earn considerably more.

RESIDENT SHOP TRAINING is easier and costs less than you may think! We provide you with housing and part-time jobs while in school, plus free nation-wide placement service for graduates.

Check subject above in which you are interested and mail for



◀ **FREE BOOKLET** ▶
BAILEY
Technical Schools



Veteran Approved
1626 S. Grand, Rm. 50, St. Louis 4, Mo.

Name _____ Age _____
Street _____
Town _____ Zone _____ State _____



DISCOVER EXCITING PROFITS Hidden in America's Mountain of Broken Electrical Appliances

EARN \$3 TO \$5 AN HOUR
spare time, full time — learn at home

400 million Appliances are in American homes right now. 76 MILLION MORE are bought each year. People need them fixed, good times or bad. YOU make good money repairing them in your basement, garage, even on your kitchen table. No experience needed!

FREE BOOK TELLS YOU HOW
24-page FREE BOOK tells about "Appliance Boom" — how you can cash in on it. FREE SAMPLE LESSON shows how simple our instruction is — how NRI can quickly prepare you for profitable future — how you even get, AT NO EXTRA COST, your own Appliance Tester Kit worth \$32.50. Get FREE Book and FREE Sample Lesson now. Mail coupon below, letter or postcard. No salesman will call.




NATIONAL RADIO INSTITUTE, Appliance Division
Dept. BE3, Washington 16, D.C.
Send Free Book, Free Appliance Repair Course Lesson. Am interested in:

☐ Spare Time Earnings ☐ My Own Business
☐ Better Job

Name.....
Address.....
City.....Zone...State.....

Accredited Member National Home Study Council



PLAY RIGHT AWAY!

Even if You Don't Know
a Note of Music Now

Now it's EASY to learn any instrument. No boring exercises. Start playing real pieces by note right away. Amazing progress at home, in spare time. No teacher. Few cents per lesson. 1,000,000 students! Write for FREE BOOK. U. S. School of Music, Studio A155, Port Washington, L. I., N. Y. Licensed by N. Y. State Educa. Dept.



YOU CAN OPERATE A GARDENCRETE CENTER

**New Wayside Enterprise Offers
High Income on Low Investment**

You can make, display and sell Gardencrete — a line of decorative masonry rich in eye-appeal and use appeal. Many items — traditional and contemporary. Bird baths, lawn seats, flagstones, vases, screen block, brick and stone for building patios, walks, planters, barbecue pits, etc. Large color range. Easy to make; no experience necessary.

This is a franchise opportunity, giving you exclusive privileges in protected territory. Broad markets . . . generous profit potentials. A timely business, with fascination, interest and opportunity to capitalize on personal vision and aggressiveness. We supply all necessary instructions and much sales cooperation. Thousands of good territories now open. Write at once for prospectus "The Gardencrete Center Idea".

W. E. DUNN MANUFACTURING CO.
727 Ottawa Avenue
HOLLAND, MICHIGAN



Science newsfront continued

field traps charged particles in space, producing the familiar Van Allen belts.

Mariner's most puzzling observation was another negative one—absence of micrometeorites, or cosmic dust, in the space path to Venus. During 1,700 hours of operation, the micrometeorite detector registered only two dust-particle impacts, both far from Venus. In a similar period, a detector near the earth would have recorded thousands of impacts. If verified in the future, this may indicate that the earth's orbit passes through an unusually dusty part of the solar system.

By raising this perplexity, and by answering some questions but not others, the highly successful Mariner experiment left the mystery of Venus still unsolved. Before Mariner was dispatched, it was already known with reasonable certainty that Venus was too hot for comfort. The major scientific controversy about Venus concerned the question: *Why* is it so hot? Two conflicting theories still stand unshaken.

One is the greenhouse theory. According to this idea, the cloudy atmosphere of Venus is relatively transparent to the sun's rays, which are absorbed by the planet's surface and converted to heat. The heat is re-radiated outward, but as infrared that's

High living. Shaving during long space flights is a problem being studied by U. S. space scientists, according to Dr. Stanley C. White of NASA. Beards are unsanitary, you see. Water is precious in a space capsule, so an electric razor might be a good idea. But the motor sparks, creating a fire hazard in the 100-percent-oxygen breathing atmosphere. Then there's the problem of fuzz-capture. In the weightless state, whiskers shaved off will float around, and a fog of stubble will permeate the space cabin.

blocked by the atmosphere. Like the glass roof of a greenhouse, the atmosphere of Venus lets sunlight in but keeps heat from getting out. So the temperature builds up inside.

The competing idea is the dust-bowl theory. This says that the main effect of the sun's rays is to produce convection currents in the atmosphere of Venus, creating violent winds and dust storms. A dust cloud 20 miles deep covers the planet. Like sand-

Organize your garage... **PRESTO!**

Use handsome new Presto Peg-Board by Masonite for quick, convenient storage space. These rugged 1/4"-thick hardboard panels come prefinished in handsome tracery design. Nail 'em up, insert hook-on fixtures, then hang everything from tools to heavy garden equipment. Cover an 8 x 12 foot wall for less than \$20.

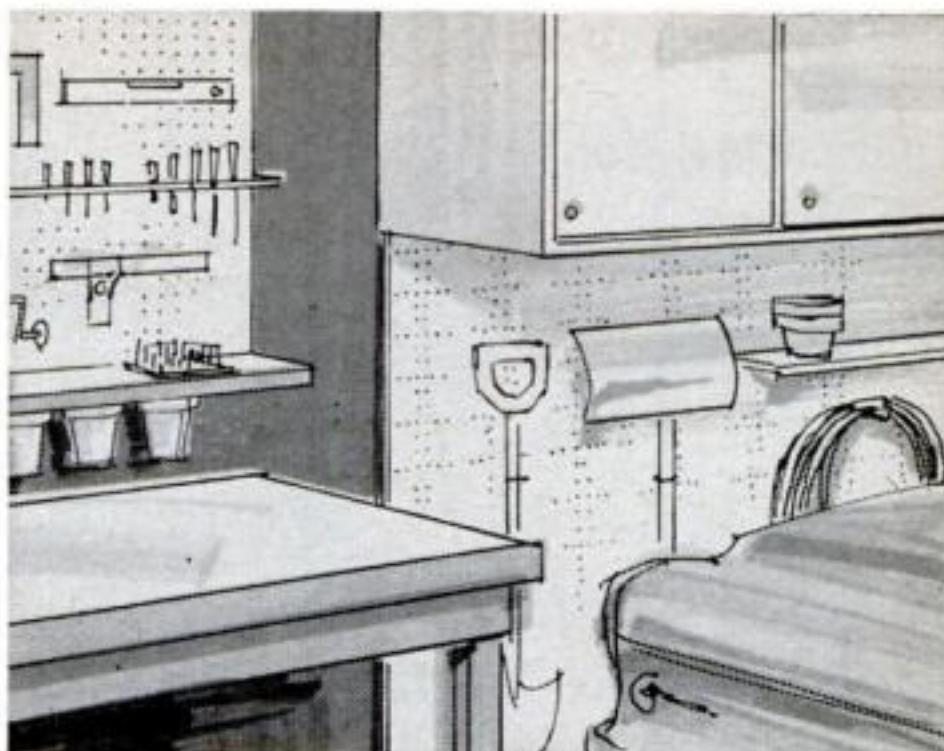
Find out about Presto Peg-Board and other Masonite hardboard panels for home improvement. Write for your free copy of our "Idea Plans" booklet.



MASONITE

shows the way

Masonite and Peg-Board are registered trademarks of Masonite Corporation.



Masonite Corporation, Dept. PS-5, Box 777
Chicago 90, Illinois

Please send me free plan on garage interior remodeling.

Name _____

Address _____

City _____

County _____ State _____



PELLET FIRING LUGER AUTOMATIC

- MAGAZINE LOADING CLIP
- OVER 15 MOVING PARTS
- FULLY AUTOMATIC

Automatic full size model of a Luger Automatic pistol—contains over 15 moving parts. Loads 8 complete rounds which snap into the hard butt simulating a Luger. Fires 8 bullet shaped pellets. Has automatic slide action.

MOST AUTHENTIC MODEL GUN WE'VE EVER SEEN

Comes to you with working parts disassembled with cleverly engineered springs, full instructions, supply of pellets and specially designed belt holster. **Full Money Back Guarantee.** Simply send \$1.98 plus 27¢ shipping charge or order C.O.D. From:

HONOR HOUSE PROD. CORP., Dept. LB-24, Lynbrook, N. Y.

ONLY
\$1.98

MY SPARE TIME HOBBY MAKES ME

**\$5⁰⁰ an hour
CASH PROFIT**

—Grover Squires



START YOUR OWN SPARE TIME BUSINESS

You can turn your spare time into Big Cash Profits with your own **COMPLETE SHARPENING SHOP**... Grind saws, knives, scissors, skates, lawn mower blades... all cutting edges. Your Own Cash Business with no inventory right at home... no experience needed.

FREE BOOK tells how you can start your own spare time business while you are still working at your regular job. Low Cost—time payments only \$15.00 a month. Send postcard today.

BELSAW SHARP-ALL CO., 703 Field Bldg., Kansas City 11, Mo.

THREE TO SEE

'**63**
for

**Aluma Craft Boats
Alpex Fiberglass Boats
Aluma Craft Trailers**



The perfect water control line in fiberglass: ALPEX runabouts, sisters to the Aluma Craft fleet!

Only Aluma Craft and Alpex Boats have Stable-matic® hulls!

AT YOUR ALUMA CRAFT

DEALER NOW! Your Aluma Craft dealer is ready with the greatest early-season fun packages ever... the world's finest aluminum and fiberglass boats... Aluma Craft's NEW "Great 8" Trailers!

Write
for Free
Catalog!

ALUMA*Craft*

BOAT DIVISION

ALPEX CORPORATION

1521 Central Ave. N.E.

Minneapolis 13, Minnesota

SEE! The new Aluma Craft Trailers—for boats from 12 to 20 feet—maximum convenience, safety, and performance.



No. 1 in aluminum... Aluma Craft—for fishing, cruising, skiing, fun for one... or the whole family... America's best boat value!



Choose from 5 with All-Gear Drive! Name the job—there's a Gravely mower for you. Choose from 50" Rotary Mower (above), 30" Rotary, 42" Sickle, 30" Reel, 75" Gang Reels. All powered by all-gear drive Gravely Tractor—powers 31 tools in all. Unique swivel action insures uniform cut every time.

Check your Yellow Pages for Gravely Sales and Service Representative. Or send for free, four-color "Power vs. Drudgery" booklet. Write Now!



TRACTOR DIVISION
Studebaker
CORPORATION

5905 GRAVELY LANE DUNBAR, WEST VA.

CUPRINOL®

WOOD PRESERVATIVE

PRESERVES WOOD FOR GOOD!

Stops Rot! Kills Termites!



ENGINEERING SCIENCE MATH

B.S. DEGREE IN 36 MOS.



U.S. NEEDS 50,000 NEW ENGINEERS EVERY YEAR

EARN ACCREDITED B.S. DEGREE in Science or Engineering in 36 months—year-round program optional. 27-month engineering diploma also available. Classes start June, September, January, March. QUALITY EDUCATION. Graduates employed throughout U.S. and foreign countries. Government approved for veteran training. Students from 50 states, 40 countries. 20 buildings; dorms, gym. Campus. New library and laboratories. Employment help provided. **SAVE TIME AND MONEY.**

Write for catalog and complete information.



Indiana Institute of Technology
formerly Indiana Technical College

1618 E. Washington Boulevard, Fort Wayne 2, Indiana

Please send free information on accredited B.S. Degree programs in Engineering and Science as checked:

- | | |
|---|--|
| <input type="checkbox"/> Aerospace Engineering | <input type="checkbox"/> Mechanical Engineering |
| <input type="checkbox"/> Chemical Engineering | <input type="checkbox"/> Metallurgical Engineering |
| <input type="checkbox"/> Civil Engineering | <input type="checkbox"/> Physics |
| <input type="checkbox"/> Electrical Engineering | <input type="checkbox"/> Chemistry |
| <input type="checkbox"/> Electronic Engineering | <input type="checkbox"/> Mathematics |

Name _____

Address _____

City _____ State _____

Science newsfront continued

paper, the agitated dust cloud heats the surface of the planet by friction.

Until one of those theories is laid to rest—if one of them is correct—the exploration of Venus is not even half finished.

It may even be too soon to say flatly that there's no life on Venus. Obviously, life as we know it—or as we can imagine it—can't exist in that furnace. At such high temperatures, chemical reactions proceed rapidly; the reactive elements needed by life are already locked up in stable, refractory end-products of chemical reaction; and the fragile, complex molecules that are typical of life don't stand a chance. Any life form that could survive would have to be based on an extremely aggressive chemistry, with a strange metabolism indeed. But it's hard to be sure that no such life form exists.

Perhaps someday we'll be able to land a rugged, heatproof television camera on the surface of the planet and really take a look around. Fragile man may even land on Venus—if he can design a suitably air-conditioned spaceship.

Hiroshima results. Returning from a two-year study of the effects of atomic radiation on the survivors of Hiroshima, Dr. Stuart C. Finch of Yale reported that cases of leukemia and thyroid cancer increased, as predicted. Contrary to expectations, though, a study of 70,000 pregnancies among parents exposed to radiation showed no increase in malformations or other genetic defects. Curiously, the boy-girl ratio of offspring was altered, depending on which parent was irradiated. If the father was exposed, a boy was more likely to be born, but more girls were born to mothers who were exposed.

BIOLOGY

The thinking worm's molecule

Would you like to learn to play the piano by getting injections? Or become a mathematician by taking calculus pills? Education may eventually be that simple.

More and more evidence seems to point to a chemical in the nervous system as the storehouse of memories, and therefore learning. Its name is ribonucleic acid, or RNA, and it's related to DNA, the substance that carries the message of heredity from genera-



NOW-You Can Fix Cars Faster

With MOTOR'S 2-in-1 Auto Repair Manual!

Fix just about any part of 2,519 models, 1955 through 1963. NEW edition. Trouble-shooter spots what's wrong—Manual pages show exactly how to fix it! Over 1,300 pages, 2,850 pictures. MUCH MORE! FREE 10-DAY TRIAL. Then, pay \$2 in 10 days, \$3 a month for 2 months, then \$1.95 (plus 45¢ delivery charge and sales tax), or return book. Send no money now! MOTOR, BOOK DEPT., Desk 325, 250 West 55th St., New York 19, N. Y.

TRY GIANT ILLUSTRATED "HOW-TO" BOOK FREE FOR 10 DAYS

Make Rubber Stamps for BIG PAY



Need more money? Earn \$30-\$50 a week, spare time, at home making rubber stamps for offices, factories, individuals. Hundreds of uses. Hundreds of prospects—everywhere. Right in your own community. Turn out special stamps for names, addresses, notices, prices, etc., in minutes with table-top machine. We furnish everything and help finance you. Write for free facts. No salesman calls.

Rubber Stamp Div., 1512 Jarvis Ave., Dept. R-3-E, Chicago 26

FREE BOAT KIT CATALOG

New 70 page catalog including cruisers, runabouts, hydroplanes, prams, sail boats, catamarans, air boats, hydrofoils, flying boats, and accessories.

TAFT MARINE WOODCRAFT

Dept. PS-563 • 636—39th Avenue N.E. • Minneapolis 21, Minn.

FREE "How To Start Your Own MAIL ORDER BUSINESS"

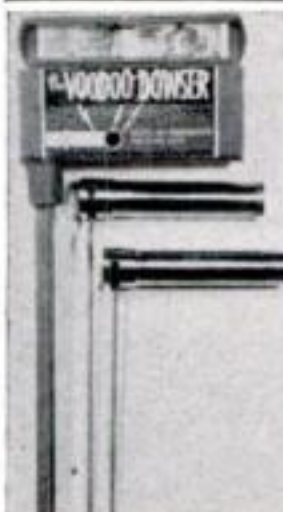
Work from your home. We supply top-notch mail order catalogs imprinted with your name and address. Simply mail out to prospects and all orders come directly to you. We carry all stock and drop-ship for you. Write today for details and free booklet. No obligation. STATILE CO., MAIL ORDER DIVISION, MONTVALE 4, NEW JERSEY

POLYSEAMSEAL®

TUB CAULK • TILE ADHESIVE

Pure White • Elastic Permanent

Sticks like glue! 101 Household Uses!



the VOODOO-DOWSER

TREASURE HUNTERS — CONTRACTORS — SURVEYORS—PLUMBERS—DITCH DIGGERS !!!!!

DETECT BURIED OBJECTS

The VooDoo Dowser locates Hollow Objects of Plastic, Wood, Concrete, Metal & Vitrics to Depth of 30 Ft.

Segregates Hollow Objects From Solids Guaranteed To Work—Compact & Lightweight Plastic Portable Container Included (Pat. Pend.)

Send \$9.75 (Prepaid) Today To:

THE KROGEN LABORATORY
809½ N. Janss St., Anaheim, Calif.

BUILD YOUR OWN Schober ELECTRONIC ORGAN



3 Models to choose from...

Concert Model \$1200

Console Model \$800

Spinet Model \$650

This is the Schober Console Model with two full 61-note keyboards, 17 pedals and 22 individual stops. It is comparable to finished organs selling from \$1800 to \$2500.

You'll love the rich, thrilling tone of a Schober Electronic Organ, and you'll love the price, too—starting as low as \$550. Whichever Schober Organ you prefer, you'll happily find it's only half the price of a comparable, ready-made organ sold in a store. In fact, many people who could well afford to buy any organ, have chosen to build a Schober Organ simply because they prefer it musically! You get a full-size organ on which you can play classical and popular music.

And you don't have to be an electronic genius to build your own Schober Organ. The clear, concise, step-by-step instructions make it realistically simple, even if you've never touched a soldering iron!

Assemble it gradually if you wish. You may start for as little as \$18.94. Or you can order all the components of your organ to be sent at once, and assemble it in as little as 50 hours!

Even a beginner can quickly learn to play a Schober Organ. You'll soon discover a whole new world of music, and endless hours of pleasure. Unquestionably, this organ is the king of instruments!

We are so proud of our organs we've made a 10" Hi-Fi demonstration record we'd like you to hear. The initial cost of the record is \$2 but this will be refunded when you send for your first organ building kit.

THE *Schober Organ* CORPORATION

43 West 61st Street, New York 23, N.Y.

Also available in Canada, Australia, and the United Kingdom

MAIL THIS COUPON TODAY

THE SCHOBER ORGAN CORP., DEPT. PS-14

43 West 61st Street, New York 23, N. Y.

☐ Please send me FREE booklet and other literature on the Schober Organ.

☐ Please send me the Hi-Fi demonstration record. I enclose \$2 which is refundable when I order my first kit.

Name _____

Address _____

City _____ Zone _____ State _____

Science newsfront continued

tion to generation [see "DNA: It Calls the Signals for Life," page 66]. Both of these chemicals have long chainlike molecules capable of recording information because they are made of units that can be arranged in many different sequences, like beads of different colors on a string.

High concentrations of RNA have been found in nerve cells. And in an experiment at McGill University, Montreal, Dr. D. Ewen Cameron found that both injections and oral doses of RNA improved the memories of aged patients suffering from memory loss.

The most conclusive evidence comes from experiments with planarians—aquatic pond worms, half an inch long, with crossed eyes and very simple brains. Worms can't learn much, but a few years ago biologists found out how to condition planarians, like Pavlov's dogs. The worms, which normally respond to mild electric shock by contracting their bodies or turning to the side, were conditioned by turning a light on just before the shock was administered. After a while, they cringed in response to the light alone. Other planarians were trained to run a simple maze in order to get to water.

One of the planarian's idiosyncrasies is that if you cut him in half, his head will regenerate a tail and the tail will grow a new head. Dr. James V. McConnell of the University of Michigan trained some planarians, then cut them in half and threw away the heads. The tails grew new heads, but the worms retained some of their earlier learning. Then McConnell chopped up trained worms and fed them to untrained worms. The cannibals evidently absorbed some of their victims' education. They learned their task more easily than worms on a less exotic diet.

Was RNA at the bottom of it all? To find out, Dr. William C. Corning of the University of Rochester cut some trained planarians in half, then allowed the tails to grow new heads in a weak solution of an enzyme that destroys RNA. After the heads had regenerated, the worms had amnesia. They no longer retained any of their training.

Experiments with planarians are continuing in a number of laboratories. This promising line of research shows how well the techniques of classical biology combine with those of the new "molecular biology."



**LAFAYETTE RADIO
ELECTRONICS**

**FREE
FOR '63**

**1963 CATALOG 630
388 GIANT SIZE PAGES**

The Largest Catalog in our 42-Year History

It's New—It's Big— It's Better Than Ever

It's from the "World's Hi-Fi & Electronic Shopping Center"

Here it is—the exciting, all-new 1963 Lafayette Catalog. 388 giant sized pages—everything in hi-fi and electronics for the audiophile, technician, hobbyist, student, engineer and serviceman. Thousands of items at lowest prices.

**Now—buy the Easy Way with Easy-Pay.
No money down . . . up to 24 months to pay.**

Lafayette Locations

Syosset • Jamaica • New York City • Bronx • Scarsdale
Newark • Plainfield • Paramus • Boston • Natick

MAIL THE COUPON FOR YOUR FREE CATALOG

Lafayette Radio, Dept. KE-3

P.O. Box 10, Syosset, L. I., N. Y.

Rush My FREE 388-Page 1963 Lafayette Catalog

Name _____

Address _____

City _____ Zone _____ State _____

Would You Like to Make \$1,000 A MONTH?



That's what Stanley Hyman made selling the amazing new Presto Fire Extinguisher! Many others "cleaning up"—so can you! Amazing tiny new extinguisher ends fires fast as 2 seconds. Guaranteed for 20 years! Sells for only \$4.95. Write for Free sales kit.

**Merlite Industries, Inc., Presto Div.,
114 E. 32nd St., Dept. P-16G, New York 16, N. Y.**



Outlasts Varnish 2 to 1

New miracle clear plastic finish dries dust-free in minutes, needs no sealer, goes on any kind of wood—inside or outside. Gives tougher, longer-lasting protection for patio furniture, siding, doors, cabinets, floors, paneling, tables, boats. Glass-like finish resists alcohol, boiling water, food acids. Won't darken, crack or peel. Odorless. Non-toxic. Gloss or Satin finish. For free brochure and nearest FLECTO VARATHANE dealer, contact:

**Flecto Company Inc., Box 84-P, Sta. A, Berkeley 2, Calif.
Flecto Coatings Ltd., 7304 Buller Ave., Burnaby, B.C.**



BE THE MAN IN DEMAND

Train for a high-paying job in one of these 4 major fields



N.T.S. trained technicians are higher paid, better skilled, confident of success.

ELECTRONICS

TELEVISION AND RADIO

Course covers TV-radio servicing, communications, automation circuitry, microwaves, ind. electronics. One Master Course; low cost. Includes TV set, radio, multimeter.



AUTO MECHANICS

AND DIESEL

All-around mechanic training. Covers tune-up, automatic transmissions, trucks and busses, stationary gas and diesel engines. Includes socket set, analyzer, tools.



AIR CONDITIONING

REFRIGERATION ELECTRICAL APPLIANCES

50 million air conditioners, refrigerators, appliances need fixing every year. Start own business or work with dealer-distributor. Includes tester, gauges, tools.



HOME APPLIANCE

TECHNICIAN'S COURSE

Full-time or "spare-time" career. Fix toasters, mixers, irons, washing machines; all appliances. Costs less than \$1.50 a wk. Includes tester, soldering set, tools.



Each of these fields offers big opportunities to N.T.S. trained men. You get everything you need — lessons, manuals, professional kits with tools and instruments for service, repair, all-around use. Study at your own pace; earn money as you learn. You enroll by mail; no salesman means lower cost for us, lower tuition for you.

NATIONAL TECHNICAL SCHOOLS

WORLD-WIDE TRAINING SINCE 1905

4000 So. Figueroa St., Los Angeles 37, Calif.

Accredited Member
National Home Study Council

RESIDENT TRAINING AT LOS ANGELES

If you wish to take your training in our famous Resident School in Los Angeles — the oldest and largest school of its kind in the world — check special box in coupon.

SEND FOR
**FREE BOOK
AND ACTUAL
LESSON IN
FIELD OF YOUR CHOICE**

NO OBLIGATION
NO SALESMAN
WILL CALL

ACTUAL LESSON



CHECK
ONE

NATIONAL TECHNICAL SCHOOLS

WORLD-WIDE TRAINING SINCE 1905

National Technical Schools, Dept. C-53

4000 S. Figueroa St., Los Angeles 37, Calif.

Please rush FREE Book and Actual Lesson checked below. No obligation. No salesman will call.

- ☐ Electronics — TV — Radio
☐ Auto-Mechanics & Diesel
☐ Air Conditioning, Refrigeration & Electrical Appliances
☐ Home Appliance Technicians Course

Name _____ Age _____

Address _____

City _____ Zone _____ State _____

☐ Check here if interested ONLY in Resident Training at L.A.
High school home study courses also offered. Check for free catalog. ☐

LITTLE PUMP DOES 1000 BIG JOBS



QUICKLY DRAINS CELLARS AND POOLS
FILLS TANKS • IRRIGATES • SPRAYS

Pumps up to 5000 GPH. Up to 60 ft. head. Threaded, 1 1/4" intake, 1" discharge. Rust-free aluminum castings. Superior design. Top quality. Fits any motor. Satisfaction guaranteed or money Standard Model refunded. Send check or M.O. \$1 deposit on C.O.D's. Flexible drive coupling \$1 extra.

895 ppd.

Heavy Duty Ball Bearing Model. \$12.95 ppd.

AMERICAN MACHINE & TOOL CO., INC.

Dept. PS-53, Royersford, Pa.

HANDLED ENTIRELY BY MAIL

BORROW \$1000
REPAY \$51.24 MONTHLY



**BORROW \$100 TO \$1000 ON
YOUR SIGNATURE ONLY • 24
MONTHS TO REPAY**

Enjoy life, end money worries! Confidential BORROW-BY-MAIL plan provides cash for any purpose. Small payments, fit your pocketbook. Private, entirely by mail. No endorsers, no personal interviews. Fast service. State supervised. Details sent in plain envelope. No obligation. Inquire now.

Amount of Loan	24 Monthly Payments
\$100	\$ 5.93
\$300	\$17.49
\$500	\$27.69
\$800	\$41.93
\$1000	\$51.24

AMERICAN LOAN PLAN Dept. HA-223
City National Bldg., Omaha 2, Nebr.

Name _____
Address _____
City _____ State _____
Age _____ Occupation _____



New Model 161 UTILITY TESTER® FOR REPAIRING ALL ELECTRICAL APPLIANCES MOTORS • AUTOMOBILES • TV TUBES

As an electrical trouble shooter the Model 161

- Will test Toasters, Irons, Broilers, Heating Pads, Clocks, Fans, Vacuum Cleaners, Refrigerators, Lamps, Fluorescents, Switches, Thermostats, etc.



- Will test all TV tubes (including picture tubes) for open filaments and burned out tubes.
- Measures A.C. and D.C. Voltages, (both 110 Volt and 220 Volt lines).
- Will measure current consumption (amperes) while the appliance under test is in operation.
- Incorporates a sensitive direct-reading resistance range which will measure all resistances commonly used in electrical appliances, motors, etc.

As an Automotive Tester the Model 161 will test:

- Both 6 Volt and 12 Volt Storage Batteries • Generators
- Starters • Distributors • Ignition Coils • Regulators • Relays
- Circuit Breakers • Cigarette Lighters • Stop Lights • Condensers • Directional Signal Systems • All Lamps and Bulbs
- Fuses • Heating Systems • Horns • Also will locate poor grounds, breaks in wiring, poor connections, etc.

Model 161 comes complete including 56-page book... Only

\$22.50

**SEND NO MONEY WITH ORDER—
PAY POSTMAN NOTHING ON DELIVERY**

Try it for 10 days before you buy. If completely satisfied then send \$5.00 and pay the balance at the rate of \$5.00 per month until the total price of \$22.50 (plus small P.P. and budget charge) is paid. If not completely satisfied, return to us, no explanation necessary.

ACCURATE INSTRUMENT CO., INC.

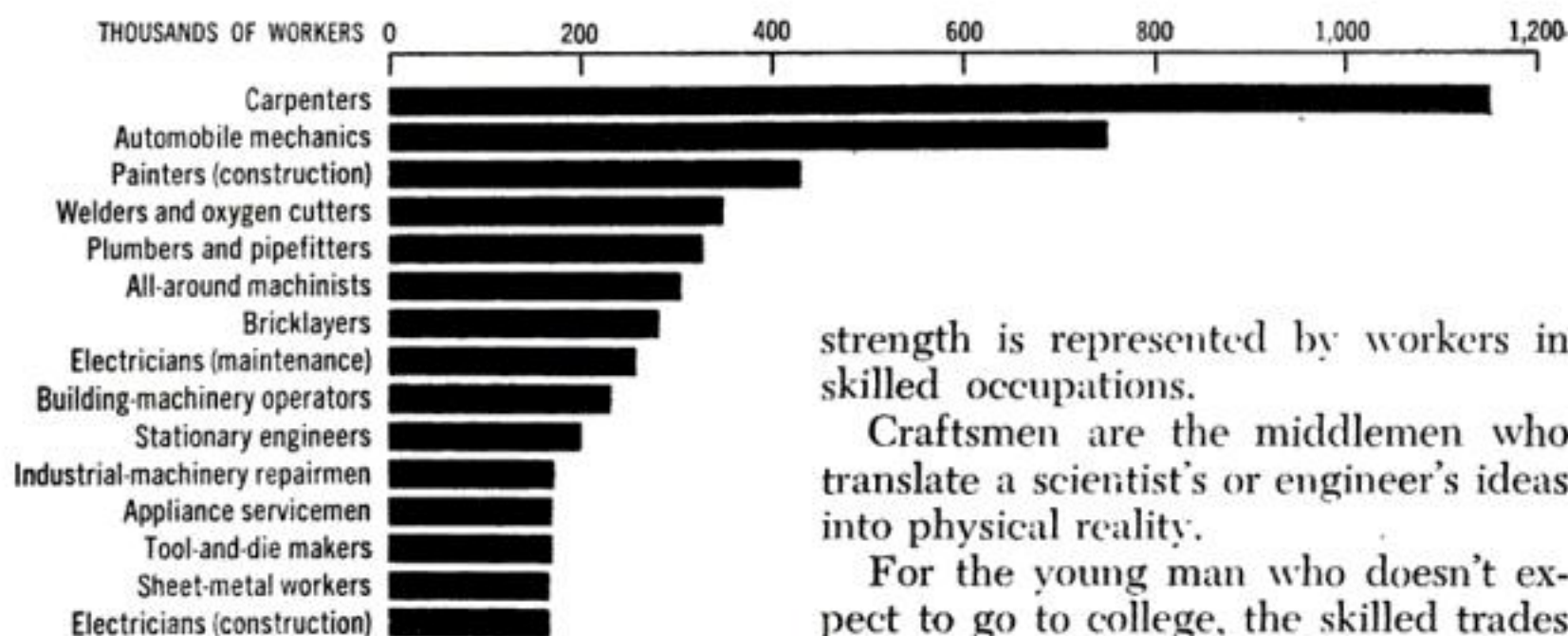
Dept. D-261, 911 Faile St., Bronx 59, N. Y.
Please rush Model 161. I will pay on terms specified. Otherwise I will return tester.

Name _____
Address _____
City _____ Zone _____ State _____
All prices net, F.O.B., N.Y.C.

Getting Ahead

By Dr. Lewis R. Fibel

A monthly column to help you prepare yourself for a better job



There are more than a million carpenters in the U.S., more than 700,000 auto mechanics, more than 400,000 construction painters. These figures, and the others in the chart, point up how large a segment of America's industrial

strength is represented by workers in skilled occupations.

Craftsmen are the middlemen who translate a scientist's or engineer's ideas into physical reality.

For the young man who doesn't expect to go to college, the skilled trades offer good pay, a secure future, and an opportunity for a rewarding career. There is every indication that the need for skilled workers will continue to grow in the decade ahead.

(Source: Bureau of Labor Statistics, estimated figures for 1960.)

The need for chemists will almost double in the next 10 years, according to the Manufacturing Chemists' Association. In 1970 the industry will need over 150,000 scientists and engineers.

A comprehensive account of career

opportunities in chemistry was given in the Jan. 28, 1963, issue of *Chemical and Engineering News*. Copies are available at 25 cents from the Reprint Department, American Chemical Society, 1155 16th St., N.W., Washington 6, D.C.

"I am a sophomore in high school and I'd like to be an architect. What colleges are best and what are the tuition costs? I am also thinking about entering the armed forces. Which should come first? Would any specific service in the armed forces benefit my architectural career?"—T.K., Kimberton, Pa.

There are 51 schools of architecture in the U.S. accredited by the National Architectural Accrediting Board. You can get the list free from the secretary, Thomas K. Fitzpatrick, School of Architecture, University of Virginia, Charlottesville. The following Pennsylvania colleges are included:

Carnegie Institute of Technology, Pittsburgh 13 (tuition, \$1,000).

Pennsylvania State University, University Park (\$480 for state residents).

University of Pennsylvania, Philadelphia 4 (\$1,250).

By the time you're ready to attend, the tuition costs may be higher. In addition it will cost a minimum of \$1,500 annually for room, board, and other expenses.

It's hard to generalize about the desirability of entering the armed forces before or after college, because so many personal factors are involved. On the one hand, the more specialized education you have under your belt, the better your chances of serving in that specialty in the forces. On the other hand, the more recent your education, the better prepared you are to enter your profes-

Not everyone does as well, but T. N. CODY, who started a business of his own, reports...

For 12 months
I've averaged

\$800

**PER
MONTH
INCOME**

—most of it clear profit for me!

Many men have discovered how to be independent, to be free of layoffs and bosses. C. G. Naples grossed more than \$200 his first week. A father-son combination grossed \$44,000 their second year. H. Lemon says, "I netted \$133 in one 8-hour day."

How much you earn depends largely on you, but we help you to start and work with you for your success. You need no special skill, no large investment. Start part time if you wish. Hire helpers as needed.

NO SHOP NECESSARY • Our **PORTABLE ELECTRIC DETERGER** shampoos rugs, carpets right on customer's floor. Wonderful results bring you repeat business, large fees. So efficient and safe, it is used by largest hotels and railroads.

OURS IS NOT A LEASE ARRANGEMENT • You are free to operate in an independent manner. You sign no contract. You own the detergent outright and are always your own boss...and every dollar you take in is yours to keep. You pay no fees, or dues, or royalties to anyone. And you take no risk. Your detergent is fully guaranteed and enough supplies come with it to return far more than your investment. Many earn the cost of the detergent in a week or two. It costs nothing to get the details...write **TODAY**.



MAIL COUPON TODAY FOR FREE BOOK

VON SCHRADER MFG. CO.
511 "R" Pl., Racine, Wis.

Without obligation send me **FREE** booklet about your **RUG DETERGER** and tell me how I can start my own permanent, profitable business.

Name _____

Address _____

City _____ Zone _____ State _____

NEW RAPID FIRE REPEATER

FIRES 200 ROUNDS

Amazing new 1963 model of WALTHER automatic... Holds and fires 200 rounds automatically from oversize chamber at incredible firing speed. Peak accuracy firing power to distances of 40 feet and more. Smooth jam-proof action guaranteed. No recoil. Non-lethal. Safe. No permit needed but not sold to minors under 16 years of age. Marines use for target practice indoors and outdoors. Walnut-Color stock is contoured to fit the hand. Send \$3.98 cash, check or money order plus 27c shipping charge. We include free ammo. Satisfaction guaranteed or money back. **Gun Dept. 5-PS, STANDARD AMERICAN SUPPLIERS, INC., 1 Park Avenue, New York 16, New York.** (200 rounds ammo \$1.00) (400 rounds ammo \$2.00) (1000 rounds ammo \$5.00)



RUPTURED

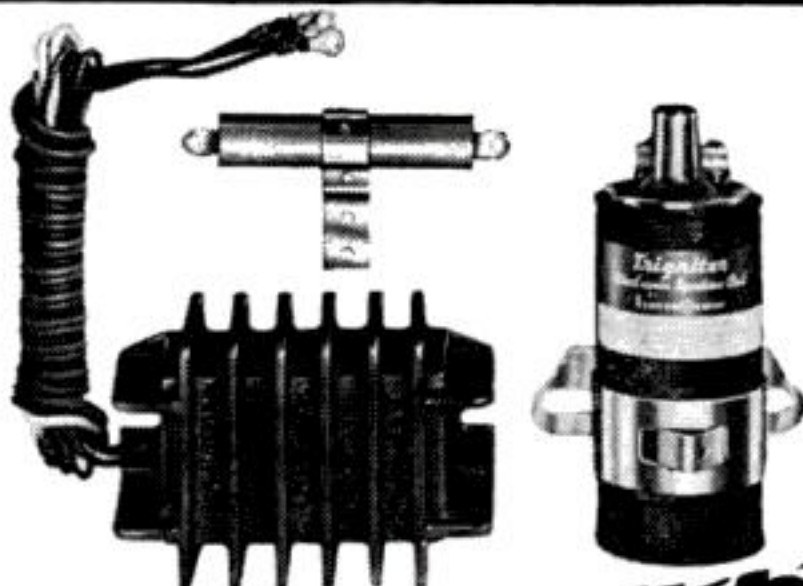
BE FREE FROM TRUSS SLAVERY

Surely you want to **THROW AWAY TRUSSES FOREVER**, be rid of Rupture Worries. Then Why Do you put up with wearing a griping, chafing and unsanitary truss the balance of your life? If you do, it will NOT be through necessity but through choice on your part.

Now there is a modern Non-Surgical treatment that is designed to correct rupture. These Non-Surgical treatments are so dependable that a Lifetime Certificate of Assurance is given. Write today for our new **FREE BOOK** that gives facts that may save you painful, expensive surgery. Tells **HOW** and explains **WHY NON-SURGICAL** Methods of Treating Rupture are so successful today. No obligation.

EXCELSIOR MEDICAL CLINIC
Dept. H6238, Excelsior Springs, Mo.

**GET MAXIMUM FIRE POWER
PLUS A LIFETIME
TUNE-UP WITH**



**ELECTROTONE'S
SS-1
IGNITER**
THE MOST ADVANCED
TRANSISTORIZED ELECTRONIC
IGNITION SYSTEM

- Eliminates spark plug, points and condenser replacement
- Special heavy duty 400:1 coil
- High voltage Bendix transistor—zener diode protected
- Improves gas mileage, assures better acceleration
- Instant cold weather starting
- Professional, patented die-cast heat-sink

Available NOW at leading auto stores and jobbers at low introductory prices

Write for new catalog sheet and name of nearest dealer...

ELECTROTONE LABORATORIES, INC.
1713 N. Ashland Ave. • Chicago 22, Illinois

NEW DELTA Fast-Flo

HIGH-VOLUME
BILGE PUMP
SUBMERSIBLE

MODEL A1100 \$19.95



- Pumps 10 gallons a minute against 3' head.
- Easily handles salty, sandy and other contaminated water. No screens to clean.
- Dependable 12-volt D.C. Leece-Neville motor... heavily chromed solid brass housing... seals resistant to oils, gasoline.
- Impeller and impeller housing of molded Delrin®.
- Compact 5 3/4" high, 4 5/8" dia., weighs only 3 1/2 lbs.
- Fully guaranteed.

NOW AVAILABLE...6-V Model A1106...\$21.95



POWERhorn Far-reaching resonant tone. Solid brass with heavy chrome finish. Motor is permanently sealed. Tone unaffected by vibration. 12-V. Model A-2998, \$12.95

FREE—Marine catalog. Write today.

Delta

LIGHTS THE WAY

Delta Electric Co., 325 W. 33rd Street, Marion, Indiana



WANT MORE MONEY? GET INTO PHOTOGRAPHY

Coast to coast, high-paying jobs in photography are waiting for people with the "know-how" to fill them. You can quickly, easily qualify at home with the world-famous NYI Learn-by-Doing Method. Write today for free catalog. Also resident training in N. Y. Our 53rd Year. Approved for Veterans.

NEW YORK INSTITUTE OF PHOTOGRAPHY
Dept. 5 10 West 33 St. New York 1, N. Y.

BE A BRIKCRETE MANUFACTURER

More Local Plants Needed

As a local manufacturing opportunity, Brikcrete has much to offer. Local markets are supplied by local plants using local materials and labor. Savings in freight and distribution enable low selling prices, high income potentials. Plants operate in franchise-protected territories with exclusive privileges. For men of modest capital, machinery is available on long-term payment.

Because Brikcrete gives so much more for so little it is the preferred masonry for homes, schools, motels practically every kind of residential, commercial,

and industrial construction. A lower-than-lumber selling price still permits 100% or more mark-up on basic production costs. And Brikcrete has quality appeal because it is outstanding in design, proportion and color. That is why market possibilities are so broad. Write or wire for Brikcrete Book No. 2.

W. E. Dunn Co.
422 W. 25th, Holland, Mich.



B-28

★
Truly —
No Clay



sion immediately, gain practical experience, and move ahead.

"What are the prerequisites for becoming a computer programmer? What is the future? Is there a possibility that the computer may eventually replace the programmer?"—C.A.H., St. Louis, Mo.

Most programmers are picked for their jobs because they have an aptitude for the work and have had some experience relating to the problems to be programmed. Requirements vary. Courses are given in a number of colleges and universities, as well as in business schools. Prospective programmers should enjoy using reasoning skills, and be patient and persistent. They should be able to work with great accuracy.

There should be thousands of new jobs created in the next few years as more and more firms use computers to process business records or to control manufacturing processes.

Your last question is a fascinating one. Computers inevitably will become more sophisticated and take over increasingly large segments of human work, but I always see "a man behind the machine." I think you need have no qualms about the availability of jobs in the foreseeable future.

"I am still in high school, but I plan to make a career of either meteorology or electronics. What are the best courses to take in high school and college?"—J.Mcl., Chandler, Ind.

For either career you should start out with an academic high-school course with as much English, science, and math as possible. A bachelor's degree with a major in meteorology is the usual minimum educational requirement for a meteorologist. Courses in physics and mathematics are also important. *Meteorologist* by A. V. Carlin (\$1, Research Publishing Co., Inc., P.O. Box 245, Boston 1) discusses the history of meteorology, the typical job opportunities, requirements, and training.

If you wish to be an electronics engineer, you'll need a bachelor's degree in engineering as a minimum.

Electronics technicians, on the other hand, can get the necessary training from technical institutes, community colleges, or from some technical schools. You might want to look at *Careers in Electronics* by J. L. Angel (\$1, World Trade Academy Press, Inc., 3 E. 48 St., NYC 17). This gives the nature



22 FT. PARACHUTE

22 ft. Circ.

\$2.95

Bright orange color—complete with white rayon shroud lines. The cloth is worth more than the price of the chute! Use them for covers, children's play tents, shrub protection, lawn furniture covers, drag chutes, boat anchors, etc.

16 PANEL NYLON—\$6.95

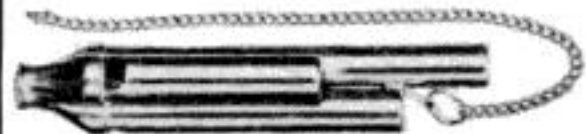
40 ft. Circ—14 ft. Across

plus 50¢ Ppd & Hdlg

Pure white nylon with nylon shroud lines! Use them for drag chutes, drop-cloths, dust covers, tents, clothing, draperies, etc. Terrific buy!

BOAT WHISTLE

Only \$2.95 Chrome Plated



Sounds like a steam job when you blow it. Heavy triple-plated chromium

over brass. Made in West Germany. Has 3 pipes and safety-chain lanyard with attachment on end to hook onto any button or nail. 6" long, 1 3/8" diam. Ideal for small boats and power boat owners. Only \$2.95. Two for \$5.70. EMPIRE MDSG., 140 Marbledale Rd., Dept. PS-563, Tuckahoe, N.Y.



Repair any watch

... SWISS OR AMERICAN

Unique, modern Sweazey System starts you making repairs right away. Develops skill step by step at home in spare time. Tuition \$5 monthly. Diploma awarded. Free sample lesson. No obligation.

CHICAGO SCHOOL OF WATCHMAKING

2330 Milwaukee, Dept. 453, Chicago 47, Ill.

"\$7,108.50 First Year SERVICING RADIATORS!"



— Hank Konter, Newcastle, Wyo.

Make good money servicing auto-truck-tractor radiators with new Inland 1-Piece Radiator Shop. Easy to test-clean-repair radiators. Inland, world's largest radiator equip. mfr., trains you free. Small down payment starts you. Easy-pay plan lets you pay from profits. Proved merchandising assures volume. Profitable dept. for garage or service station. WRITE for Free Book.

INLAND MFG. CO., Dept. PS-5, 1108 Jackson St., Omaha 2, Nebr.

BUY FACTORY DIRECT!

WREN

MINI-BIKE! \$99.95

Send 25c for brochure Many Models



\$10.00 Down
\$6.00 a Month
Complete with
Clinton 2 1/2 H.P.
engine

Order Now!

Bird Engineering, Box 427, Dept. PS-W-5 Omaha, Nebr.



ELECTRONIC ENGINEERING TECHNOLOGY

Associate of Science Degree • 24-months course

Professional technical career opportunities open to young men and women in broad range of activities: communications, computers, radar, aviation and navigational aids, industrial controls, guided missiles, etc. 15-week trimesters in Miami. Write today for FREE BULLETIN.

EMBRY-RIDDLE AERONAUTICAL INSTITUTE
(Founded 1926) a non-profit institute of higher education
Dept. B, Miami, Florida

Name
Address
City Zone State

Dr. Grabow Continentals



#22



#20



#25



#21



The Dr. Grabow
Symbol of
Quality

World's Finest Imported Briar

Starfire ... \$ 4.95

Viscount ... \$ 5.95

Eldorado ... \$10.00

Pipes shown available
in all three price ranges.

Dr. Grabow Pipes
need no breaking in.
They are mechanically
pre-smoked and ready for
you to enjoy the most in rich,
sweet, cool, satisfying smoking.

Write for free booklet
Dr. Grabow Pre-Smoked Pipes • Greensboro, N. C.



ASK FOR **HASTINGS**
PISTON RINGS
OIL FILTERS
CASITE ADDITIVES
Best \$ you can spend on your car

\$6.44 AN HOUR IN YOUR OWN BUSINESS



STEP INTO THIS BOOMING \$19 BILLION A YEAR INDUSTRY

Hundreds of accidents and losses will happen this year in your community.

We'll show you how to investigate and adjust these losses for insurance companies, railroads, government offices. You buy NO tools or equipment. You do NO selling. You need NO prior

experience or higher education. And you can operate out of your own home. Right

now independent Accident Investigators average \$6.44 an hour. We'll train you quickly to do the same. Start part-time if now employed. Fill the need for an Accident Investigation specialist in your area. Colorful booklet explains everything. Absolutely no obligation on your part. No salesman will call. Write TODAY for FREE Booklet.

UNIVERSAL SCHOOLS, PS-5, 6801 Hillcrest, Dallas 5, Texas

WEAR THE SHOE THAT'S JOB-FITTED FOR YOU

Thorogood®

Designed and built for comfort and service . . . 50 different Thorogood Job-Fitted Work Shoe styles to meet the requirements of 30 basic occupations. Look for dealers displaying the Thorogood sign; or write to us for the name of the one nearest you.

Weinbrenner

A **textron** DIVISION
MILWAUKEE 1, WISCONSIN

Luger Fiberglass or Plywood BOAT KITS Save You Money!

FREE 64 PAGE
Full Color
Boat Kit Catalog



Save \$1000 to \$2500 on 18'-20'-22'
LUGER LUXURY CRUISERS . . .

and to \$500 on speedy 14' or 16' Molded Fiberglass Runabouts! Over 50 Models! Easily assembled by anyone with ordinary tools. Every part and every section comes pre-cut, pre-assembled or precision molded from factory. Just put sections together! Many models take only one or two evenings to complete. Easy Terms! 3 Years to Pay! Money Back Guarantee! Rush name, address for big full color catalog—64 pages—FREE! Write

LUGER BOAT KITS, Dept. A-53
9200 Access Road, Minneapolis 31, Minn.

Want BIG PAY—
Your Own Business?

Be a

LOCKSMITH



306

pieces

of equipment
locks, Picks,
Tools, Parts
supplied
for use
with course

You can quickly step into a well-paid job or start a big-profit business of your own. Shortage of locksmiths means opportunities everywhere, spare-time or full-time in good times or bad.

EARN EXTRA MONEY FROM THE START
All Special Tools, Supplies Furnished

Age, education, minor physical handicaps don't matter in this growing, steady-income trade. You learn fast at home—gain practical experience through well-illustrated lessons. You do real jobs under the personal guidance of experts.

ILLUSTRATED BOOK—FREE

For a future as your own boss, or in a big pay job, send for FREE illustrated book today. No salesman will call. Only school of its kind. Lic. State of N.J.; Accredited Member National Home Study Council. Vet Approved.

MAIL COUPON NOW



Please send
without
obligation
FREE
Illustrated
Book and
sample lesson
pages.

LOCKSMITHING INSTITUTE
(Div. Tech. Home Study Sch.)
Dept. 205-3, Little Falls, New Jersey

Name

Address

City..... Zone..... State.....

of the work, opportunities, training, and salaries for a variety of jobs such as electronics engineer, machines technician, television technician, and repairman.

"Where can I study quality-control engineering and technical inspection?"
—G.H.W., Rapid City, S.D.

Generally this work is done by industrial engineers, although other engineers are qualified. The Engineers Council for Professional Development has accredited industrial-engineering curriculums in 44 colleges and universities. Those nearest you are:

Montana State College (Bozeman).

Kansas State University (Manhattan).

Oklahoma State University (Stillwater).

Many technical inspectors, however, are not engineers. Technical-institute graduates are often highly regarded for such jobs. The Milwaukee (Wis.) School of Engineering and the Technical Institute Division of the University of Dayton (Ohio) are two schools that can give you further information.

"I'd like a career acting in motion pictures. Can you give me the names of some schools where I could get more information?"—G.B., Cleveland.

Creating a character before an audience is glamorous but very demanding work. Even if you have the talent, there are very many uncertainties. Few actors achieve stardom.

But many schools and colleges offer dramatic training. Here are two schools in Cleveland:

Harris Hardy Studios of Stage Arts, 5324 Superior.

Play House, 2040 E. 86 St.

"What schools near my home offer courses in aircraft maintenance?"—D.H.K., Sheboygan Falls, Wis.

Here are four Wisconsin schools that have such programs:

Chippewa Falls Vocational School

Janesville Vocational School

Kenosha Vocational School

Milwaukee Vocational School

.....

Send your questions on careers and technical training to:

Getting Ahead Editor, POPULAR SCIENCE
355 Lexington Ave., New York 17, N.Y.

Not every question may be used. Questions cannot be answered by individual letters.

engineering degree in 27 months

Industry demands graduates. Enjoy higher income... advancement. Major corporations regularly interview and employ seniors. **BACHELOR OF SCIENCE DEGREE IN 27 MONTHS** in Electrical, Mechanical, Aeronautical, Chemical, Civil Engineering. **IN 36 MONTHS** a B.S. Degree in Business Administration (General Business, Accounting, Motor Transport Administration majors). One-year Drafting-Design Certificate Program. Small classes. More professional class hours. Well-equipped labs. Campus. Dorms. New library. Moderate costs. Founded 1884. Enter June, September, January, March. Write J. F. McCarthy for Catalog and "Your Career" Book. Learn more and you'll earn more.



TRI-STATE COLLEGE

553 College Avenue • Angola, Indiana

You Can Have a HE-MAN Voice

STRENGTHEN your voice this tested, scientific way. Yes—you may now be able to improve the POWER of your speaking and singing voice... in the privacy of your room! Self-training lessons, mostly silent. No music required.

FREE BOOKLET

Write today for Eugene Feuchtinger's great booklet "How to Develop a Successful Voice." It's absolutely FREE! You must state your age. Booklet mailed postpaid in plain sealed envelope. No salesman will bother you. Send your name and age RIGHT NOW!

PREFECT VOICE INSTITUTE, 325 W. Jackson Blvd., Studio EY-1, Chicago 6, Ill.



*** NOW! EARN BIG MONEY IN * ART**
*** CARTOONING AND COMMERCIAL * ART**

Now you can enter this highly-paid field quickly and easily. Learn in your own home, in spare time. No previous training or art ability required. Own your own business—urgent demand for artists everywhere! Earn 100% profit on all drawings—we show you how!

→ illustrated book **FREE!**

Continental Schools, Inc. Dept. E-70 4201 S. BROADWAY, LOS ANGELES 37, CALIF.

Free Book on Arthritis And Rheumatism

HOW TO AVOID CRIPPLING DEFORMITIES

Explains why drugs and medicines give only temporary relief and fail to remove the causes; tells all about a proven non-surgical, non-medical treatment which has proven successful since 1919. Write for this 36-page FREE BOOK today. No agent will call.

Ball Clinic, Dept. 3-36-M Excelsior Springs, Mo.

BORROW MONEY YOU NEED FROM US BY MAIL

B-I-C Cash-By-Mail Loans—\$100.00 to \$600.00 easy to arrange—easy to repay on 24-month schedule. No co-signers or security needed. **DON'T DELAY—MAIL COUPON**

Please send me, by return mail, Application Form for B-I-C Cash-By-Mail Loan. I understand this request does not obligate me in any way.

Name.....
 Address.....

B-I-C LOANS
 Div. Bankers Investment Co.
 Dept. 65 100 S. WALNUT, HUTCHINSON, KANSAS

THIS IS OUR 1963 MODEL; IT LOOKS LIKE OUR 1962. CHECKER



Most Checker owners plan to keep their cars 5 years or longer and appreciate our policy of making improvements without obsoleting the car. This is another built-to-last feature. A Checker keeps its value because it's a practical car, too. Higher, wider door openings for easy entrance and exit, 8-passenger interior roominess, flat rear floor, the super-safe X-Brace frame — plus a thrifty 6 cylinder engine. Want to know more? Write today!

CHECKER MOTORS CORPORATION

Dept. Y-2 KALAMAZOO, MICHIGAN

Name _____

Address _____

City _____

State _____

free...
 information
 on the
 world's
 happiest
 hobby!



ELECTRONIC ORGAN KITS

for home, school, church, clubs.

The Original "Build-it-Yourself" Organ sounds like a glorious pipe organ

SAVE 70%
 up to



Anyone Can Do It! Here's What You Get



Manuals & Couplers, Tone Generator, Tone Changers, Pedal Keyboards, Consoles

Mail coupon below, and receive... absolutely FREE... complete information on Artisan's new 1963 Organ-Building Kit! Illustrated instructions lead you through every step of this happy hobby, as you assemble-at-home a magnificent custom Artisan electronic organ — the best in tone and styling! No technical skill required, and you save up to 70% of comparable ready-built organ costs by skipping dealer profits and factory labor! You can play as you build and pay as you build. From \$1750 to \$7500. Write today!

ARTISAN ORGANS 2476-PS N.Lake Ave., Altadena, Calif.

NAME _____

ADDRESS _____

CITY _____

ZONE _____

STATE _____

1963 BSA SUPER ROCKET



**delivers high performance!
reflects brilliant beauty!**

A famous and superbly designed twin cylinder sports motorcycle now improved for even better performance. Beautifully finished in blazing red enamel, with fully chromed fenders, and many other parts in chrome and highly polished alloy.

BSA MOTORCYCLES
The most popular motorcycle in the world

Write to the nearest address for illustrated free color catalog of the new 1963 models.

Catalog offer limited to U. S. residents only.

West:
HAP ALZINA
Dept. S53
3074 Broadway
Oakland, California

East:
BSA INCORPORATED
Dept. S53
639 Passaic Ave.
Nutley, New Jersey



**FOR ACCURACY IT'S
HULL COMPASS**

When buying a compass, you want accuracy above all else. You get it with HULL—the compass that works—for cars or boats. Easier, more positive compensation.

\$5.95 TO \$7.50 AT YOUR DEALER'S OR WRITE FOR LIT.
HULL MFG. CO., Box 246-E-5, Warren, Ohio



Arrow... Lean and Lithe!

14 ft. lapstrake fiberglass runabout

In Arrow, we created a family-sized "compact"; lapstraked it for whaleboat stamina and fast turns without slipping or sliding; and reinforced the hull at every point of stress. Write for free color catalog. Starcraft Boat Company • Dept. PS-5 • Goshen, Indiana

STARCRAFT
AMERICA'S MOST POPULAR BOATS

42 POPULAR SCIENCE MAY 1963

**BE A
REAL
ESTATE
BROKER**



PAYS BIG! SEND FOR FREE, BIG, ILLUSTRATED CATALOG NOW! Graduates report making substantial incomes. Start and run your own business quickly. Men, women of all ages, learn easily. Course covers Sales, Property Management, Appraising, Loans, Mortgages, and related subjects. **STUDY AT HOME** or in classrooms in leading cities. Diploma awarded. Write TODAY for free book! No obligation.

Approved for World War II and Korean Veterans
WEAVER SCHOOL OF REAL ESTATE (Est. 1936)
3523 G Broadway, Kansas City 11, Mo.

**FREE
BOOK
TELLS
HOW**



BARBELLS

140-Pound, CHROME DELUXE Barbell-Dumbbell set only \$19.80. This is our feature set and is the finest ever manufactured. Training with adjustable weights is the BEST way to keep fit; the ONLY way to develop great strength and a perfect body. As the oldest and best equipped barbell company, BUR gives great value and prices no one can equal. Buy from manufacturer.

**SEND FOR FREE CATALOG
BUR BARBELL CO.
Lyndhurst 5, New Jersey**

LEARN PLASTICS



COMPLETE LOW COST SHOP METHOD HOME TRAINING NOW AVAILABLE

Get in on Big Money opportunities in Plastic molding, casting, forming, carving, etc. Earn as you learn with Interstate's professionally prepared course. All plastic materials furnished.

**WRITE FOR
FREE
BOOKLET**

**INTERSTATE TRAINING SERVICE
DEPT. C-2, PORTLAND 12, OREGON**

**EXCLUSIVE DOUBLE-BEARING
HEAVY DUTY PUMPS**



IRRIGATE • DRAIN • CIRCULATE • SPRAY
Use 1/4 HP motor or larger... 1 HP for up to 5,200 GPH; 1,000 GPH 60' high; or 3,000 GPH from 25' well. 1 1/4" inlet; 1" outlet. Stainless shaft. **TYPE X—2 oil-less \$10.95**
bronze bearings. Won't rust. **TYPE XB—Ball bearing model. \$12.95**
Best for belt drives. Postpaid if cash with order. Don't delay—send for yours today!

MONEY BACK GUARANTEE
Centrifugal and Gear Pumps in All Sizes
LABAWCO PUMPS, Belle Mead 4, N. J.

BUILD FINE GRANDFATHER CLOCK NOW

The simple sensible SPEEDE Red-i-Kut way as thousands have—FOR YOURSELF OR SELL AT A GOOD PROFIT. SAVE HUNDREDS OF DOLLARS. SHOP TESTED PLANS "SPIRIT OF THE CENTURY". Narrow waist 83" tall or stately straight side "SPIRIT OF AMERICA". EASY-TO-FOLLOW photopack PLANS & LIFE SIZE PATTERNS tell all—plus MOVEMENT BROCHURE \$42 up, heavy brass weight (Kuempel original) Westminster, tube Bell chime, movements, gorgeous bronze-silver MOVING MOON dials. LYRE pendulums. 3/4" solid-mahogany Jiffy Joint-Kwik-Bilt case kits. Send \$1.00 today—Both plans. Rush \$1.50 as folks have done for over forty years.

Kuempel Chime Clock Works, 18 Kuempel Bldg., Minneapolis 16, Minn.

SKIN DIVING ENCYCLOPEDIA

96 page catalog and handbook of the world's most fascinating sport. Thousands of items from all over the world. Aqua lungs, suits, guns, watches, etc. for the diver, water skier, boatsman, fisherman, etc. Compare every item made before you buy, and save.

REGULAR \$1.00 NOW! 50¢

Free Gift Certificate Offer Included.

CENTRAL SKINDIVERS
160-09F Jamaica Ave., Jamaica 32, N. Y.

**A BUSINESS OF YOUR OWN
REPAIR HYDRAULIC JACKS**



Earn while you learn at home. Millions of jacks in gas and auto-service stations, truckers, body-shops, riggers, factories, farms need servicing. We show you HOW—easy step by step directions and what tools to use. EARN UP TO \$5 an hour, in spare time, in your basement or garage. Start your own business NOW! Write for folder PS-5 and free bonus offer

INSTITUTE OF HYDRAULIC JACK REPAIR
P. O. BOX 50 • BLOOMFIELD, N. J.
A Correspondence School Licensed by N. J. Bd. of Ed.



Shrinks Hemorrhoids New Way Without Surgery Stops Itch - Relieves Pain

For the first time science has found a new healing substance with the astonishing ability to shrink hemorrhoids and to relieve pain - without surgery.

In case after case, while gently relieving pain, actual reduction (shrinkage) took place.

Most amazing of all - results were so thorough that sufferers made astonishing statements like "Piles have ceased to be a problem!"

The secret is a new healing substance (Bio-Dyne®) - discovery of a world-famous research institute.

This substance is now available in suppository or ointment form under the name Preparation H®. Ask for it at all drug counters.

OPERATE A FIX-IT SHOP

Earn Big Money. Repair household appliances, rewind motors, sharpen mowers, saws, do house wiring, etc. Every neighbor, stranger a prospect. We show you how to make repairs, secure business, what to charge, buy needed parts wholesale, etc. FREE BOOK.

Dept. A-3301 **CHRISTY TRADES SCHOOL** 3214 W. Lawrence Chicago 25

LEARN IBM

AT LAST! With THOUSANDS of prestige positions waiting for new data processing technicians and PAY scales at a RECORD HIGH. A.T.C.'s exclusive methods are available to you in a SPECIAL HOME STUDY PROGRAM GEARED TO YOUR TIME AND BUDGET. No contracts to sign... you pay for each lesson only when you order it! Send for your Giant 'IBM CAREER CATALOG' TODAY! Enclose \$1.00 to cover cost of postage and handling. No obligation of course.

AUTOMATION TRAINING CORPORATION
7023 E. Kirby, Dept. P553, Detroit 11, Mich.

GUITARS Big Discounts BUY DIRECT! WHOLESALER-TO-YOU!

SAVE! BIG DISCOUNTS! Nationally advertised guitars. Over 100 models, all styles, for students and professionals. Low as \$19.95! DIRECT from Wholesaler-to-You. Easy Terms, low as \$5.00 down! FREE Home Study Course and Bonus Gifts! Discounts on banjos, mandolins, ukes. Satisfaction or money back. Free Color Catalogs, low discount prices. Write: **GUITAR WORLD, Dept. P-53** 2003 W. Chicago Ave., Chicago 22, Illinois

LAW FREE BOOK THE LAW TRAINED MAN

Write today for a FREE copy of illustrated law book. "THE LAW TRAINED MAN," which shows how to earn the professional Bachelor of Laws (LL.B.) degree through home study of the famous Blackstone Law Course. All necessary books and lessons provided. Moderate cost; convenient monthly terms. Write for FREE law training book today.

Blackstone School of Law, 307 N. Michigan Ave.
Founded 1890 Dept. 125, Chicago 1, Illinois

FALSE TEETH BREAK?

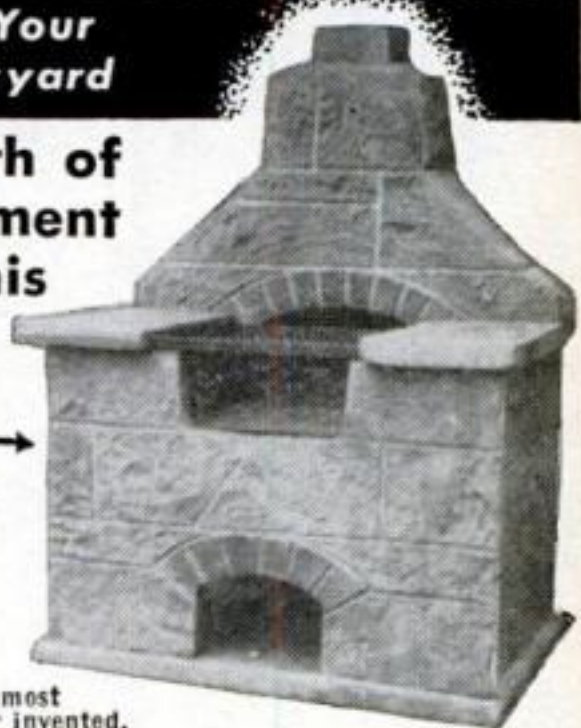
GOOD NEWS Now repair them at home in 8 minutes
Amazing PLATE-WELD repairs clear and pink plates and replaces teeth. Simply flow on - put together. Works every time - holds like new or your money back. At Drug Stores or send \$1.98 plus 22c handling to **Home Dental Aids Co., Box 1731, Dept. 13A, Bakersfield, Calif.**

43

MANUFACTURE THIS BEAUTIFUL CONCRETE OUTDOOR FIREPLACE

Right In Your
Own Backyard

\$4.00 Worth of
Sand & Cement
produces this
Attractive
Fireplace.



Sells on Sight
from \$60. to \$80.
Easy to start your
own Profitable
Business.

The General Fireplace
Molds and Process are the most
amazing and foolproof ever invented.
Simple to operate. Two men can produce five fireplaces a day.

BIG DEMAND!!

Sell all you produce to Department Stores, Homeowners, Parks, Nurseries and Picnic Groves. Fireplaces sell on sight. No experience necessary. We supply full operating instructions and equipment plus the know-how that spells BIG PROFITS. This is an outstanding opportunity for men of vision and small capital to get into a busy rich paying field. Don't delay, be the only exclusive manufacturer in your own home town. Mail coupon at once for full details as to how you can reserve your territory. Molds sold only on exclusive franchise

GENERAL ENGINES CO., Inc., Dept. SF-53
ROUTE 130, THOROFARE, NEW JERSEY

Mr. Tor of Philadelphia writes:
Sold 250 in first 4 months. Selling to Sears Roebuck, John Wanamaker, and Gimbel Bros. in Philadelphia area.

Name
Address
City Zone.....
State

BUILD, FLY ONE-MAN COPTER

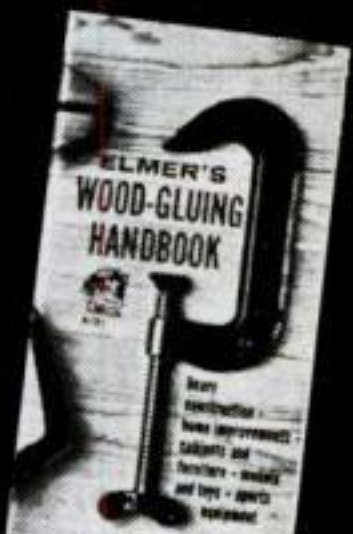


Send
\$1
or
\$2

Fun to build, inexpensive, easy to fly. Factory kits available. Order 3-view drawings, specs, photo of Gyro-Copter \$2 or motorless Gyro-Glider \$1. Send coupon today.

BENSEN AIRCRAFT CORP., Dept. PS-53
Raleigh-Durham Airport, Raleigh, N.C.
NAME
ADDRESS

FREE "HOW-TO" HANDBOOK ON GLUING



NEW 12-page Elmer's Wood-Gluing handbook gives you details on gluing for heavy construction, home improvements, cabinets and furniture, models and toys, sports equipment. Contains hints, tips, and shortcuts. Includes drawings, as well. Tells you what glue to use indoors and out. Send stamped, self-addressed envelope for your free copy. Elmer, The Borden Company, Dept. PS-53, 350 Madison Ave., New York 17, N. Y. (Available in Canada.)



HOMework

The pressure's on. Times are critical.

He has to be prepared. He has to learn as much as he can about his company and its competitors. He's boning up on the market, and production, and distribution. But he needs to know more.

Who can say what major business decision this year will be influenced by his knowledge about such divergent subjects as . . . Railroads or Rockets . . . Farming or Foreign Affairs . . . Books or Boating.

Within these pages, he finds information and products that help him form his opinions.

He's the man that gets the business . . .

. . . and he reads this magazine, just as you do.

MAGAZINES... *your world of ideas and products*

'62 INDIANAPOLIS "500" CLASSIC

8 mm.
COLOR
RACING
MOVIES

Every thrilling moment of the 1962 Speedway Classic captured for you to relive over and over again with your own 8 mm. home movie projector! 152 ft. of 8 mm. film in full color shows Ward, Sutton, Sachs, Davis and Jones seeking victory at record breaking pace, plus 4-car crackup in 19th lap. At a price you couldn't equal if you did it yourself!

Only \$10.95

Build a home sports film library. Write now for list of other films available including 1960 and 1961 Indy Races, Golf Lessons, Bowling, Viewer, etc.

SPORTLITE FILMS, Inc. 20 N. Wacker Dr.
Dept. PS Chicago 6, Ill.



LEARN CRIMINAL INVESTIGATION at home

Prepare for an exciting job, good pay, security! We teach you **at home in spare time**. Learn Finger Printing, Firearms Identification, Criminal Investigation, Police Photography. Low cost; easy terms. Over 800 Bureaus of Identification employ our graduates! Write for famous "Blue Book of Crime"—**free!** State age, please. (A Correspondence School Since 1916).

Institute of Applied Science
1920 SUNNYSIDE AVENUE • DEPT. 1365 • CHICAGO 40, ILLINOIS

PROFIT IN YOUR SPARE TIME

SMALL ENGINE REPAIR PAYS BIG!

Outboard • Powermower • Chain Saw • Tractor
MAKE EXTRA MONEY — or fix your own engines and **SAVE!** Illustrated, easy-to-learn Home Study Course qualifies you as expert. Free information. Write today!

LINCOLN TECHNICAL INSTITUTE
Suite 5-G, 472 Market Street, Newark 5, N. J.

Graphoanalysis

**LEARN TO ANALYZE HANDWRITING—
THE PROVED, SCIENTIFIC WAY!**

YOU can learn to analyze character from handwriting. Clinically proved principles of Graphoanalysis help you understand people—including yourself. Fascinating home-study training. Many career opportunities for both men and women, full or spare time. Send for **FREE** catalog and sample lesson. No salesman will call. (State age.)

INTERNATIONAL GRAPHOANALYSIS SOCIETY, INC.
325 West Jackson Blvd. Dept. EY-1 Chicago 6, Illinois



LEARN MEAT CUTTING

Train quickly in 8 short weeks at Toledo for a bright future with security in the vital meat business. Big pay, full time jobs—**HAVE A PROFITABLE MARKET OF YOUR OWN!** Pay after graduation. Diploma given. Job help. Thousands of successful graduates. Our 40th year! Send NOW for **FREE** catalog. No obligation. G. I. Approved.

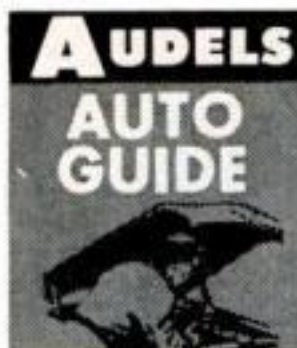
NATIONAL SCHOOL OF MEATCUTTING, Dept. 51-T, Toledo 4, O.

**Please Mention Popular Science
When Writing to Advertisers**

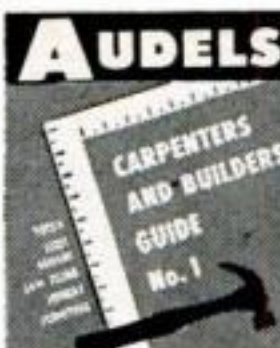
JEEP OWNERS

Re-Power NOW with a V-8 or 6 Cyl engine—Use
Ford • Chev • Mercury • GMC • Pont • Stude • Dodge or Plymouth in Jeeps, Jeepsters, Sta-Wgn, Trucks, Kaiser & H. J. cars. Conversion kits \$43.35 to \$56.90. Want fast action? Give us full information, send \$15.00 Dep. and we will ship correct kit. Bal. COD. Send full amount for prepaid shipment. Wire, phone or write today. Details **FREE**.

HOOSIER MACHINE PRODUCTS CO.
314 S.E. 6th St. Phone 276-3442 Pendleton, Oregon



Ready guide for mechanics, stdnts. & car owners. Theory, construction and servicing of modern cars. Illus. 1132 Pgs. \$6.00
Circle No. 1 in COUPON



Four all-inclusive vols. Modern construction for carpenters, builders, and all woodworkers. 3700 Ill. 1600 Pgs. Set \$9
Circle No. 8 in COUPON



How to fix elec. refrigerators, washers, ranges, toasters & all other gas & elec. appliances. 500 Illus. 864 Pgs. \$6.00
Circle No. 2 in COUPON

No. 11	MATHEMATICS MADE EASY. 672 Pages	4.00
No. 14	REFRIGERATION & AIR CONDITIONING. 1360 Pages	6.00
No. 26	MASONS & BUILDERS GUIDES. 4 Book Set	9.00
No. 43	DO-IT-YOURSELF ENCYCLOPEDIA. 2 Book Set	8.95
No. 44	NEW MECHANICAL DICTIONARY. 712 Pages	6.95
No. 48	GAS ENGINE MANUAL. 480 Pages	4.00
No. 49	OUTBOARD MOTORS & BOATING GUIDE. 400 Pages	4.00

7-DAY FREE EXAMINATION

SEND NO MONEY—Pay the postman nothing! We'll send you any of the Audel Guides for **FREE** examination. If you decide to keep the books you pay for them under our easy-pay plan of only \$2 a month.

HERE IS ALL YOU DO

IT'S EASY TO ORDER: In the No-Risk Mail Order Coupon below draw a circle around the number of Guides you want. We will send them to you at once. If you are not completely satisfied, return the books to us.

MAIL THIS COUPON TODAY!

THEO. AUDEL & CO. — Self Improvement Publishers Since 1879
49 W. 23rd Street, New York 10, N.Y.

\$5

Please mail me for 7 days' **FREE EXAMINATION** the books I have circled below. I agree to mail \$2 in 7 days on each book or set ordered, and to further mail \$2 a month on each book or set ordered until I have paid the purchase price, plus shipping costs. If I am not completely satisfied with my Audel Guides I may return them.

NAME _____
ADDRESS _____
EMPLOYED BY _____
1 2 8 11 14
24 43 44 48 49 ☐ Check Here for Free Complete Catalog
☐ **SAVE SHIPPING COSTS!** Check here if you enclose complete payment with order. We pay postage charges. You have same return privilege.

MAKE UP TO \$5.00 AN HOUR AT HOME

Let Me Prove It To You FREE!

I'll show you how Plastic Sealing and Laminating at home, spare time, can give you as much as \$5.00 each hour you operate. Table-top machine sets up anywhere. Easy. Fun. No experience needed. We furnish everything. We'll even help finance you. No house-to-house selling. Orders come by mail. Write for facts **FREE**. No salesman will call.

WARNER ELECTRIC, 1512 Jarvis, Dept. L-3-E Chicago 26, Ill.



ENGINEERING



Heald's Micro-wave and Radar Laboratory Equipment.
**ENROLL NOW
FOR NEW TERM**

**AMERICAN INDUSTRY NEEDS
TRAINED ENGINEERS NOW
BACHELOR OF SCIENCE
DEGREE, 30 MONTHS**

SAVE 2 YEARS' TIME

B.S. Degree Courses:

- ☐ Electronic Engineering
- ☐ Electrical Engineering
- ☐ Mechanical Engineering
- ☐ Civil Engineering
- ☐ Architecture

Diploma Courses:

- ☐ Radio-Television Plus Color Technician
- ☐ Electronic Technician
- ☐ Architectural Drafting
- ☐ Mechanical Drafting
- ☐ Structural Drafting

APPROVED FOR VETERANS
Send for **FREE** Information

HEALD Engineering College

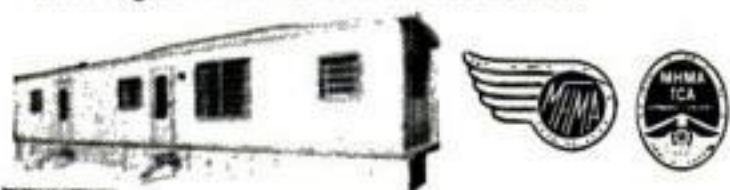
Van Ness at Post, Dept. PS-563 San Francisco, California

NAME _____
STREET _____
CITY _____ STATE _____



Custom-Plan your
Schult mobile home
this easy way

One of the most helpful planning aids offered by your Schult Dealer is this photo-plan kit. Individual room photos are in blueprint scale and can be moved and changed at will. Lets you see your plan in picture form. Other Custom-Plan helps such as colors, fabrics, blueprints, etc., are available. Write for catalog and name of nearest dealer.



SCHULT MOBILE HOMES CORP.
Dept. S
Box 401, Elkhart, Indiana, Phone Middlebury 825-2131
Box 299, Elkton, Maryland, Phone Export 8-2100
Greenwood at Midland, Ironwood, Michigan, Phone 1126



Permanent Sealer

Ready to use—no mixing required
Sticks tight on any surface

- metal
- wood
- aluminum
- tile & concrete

49¢, 98¢ tubes & cartridges

W. J. RUSCOE CO.
Akron 1, Ohio

can even be applied under water!



NEW HI-FI PERFORMANCE

The Exciting NEW **BENJAMIN**
MODEL 422 CO₂ 10-SHOT SEMI-AUTOMATIC
.22 PELLET PISTOL

EFFICIENT—SAFE—DEPENDABLE—CONVENIENT
Famous BENJAMIN Quality

AT LAST—an Amazing New Handgun that incorporates the Characteristics Wanted for Serious Training, Plinking and Match Competition—Indoors and Outdoors—at LOWEST SHOOTING COSTS! Handsome, Dynamic, Mechanically Reliable, MODEL 422 combines Traditional BENJAMIN PEAK POWER and ACCURACY with Incredible Firing Speed—Smooth JAM-PROOF ACTION (no ramrod for cleaning pistol bore required)

KEEPS SHOOTING & SHOOTING & SHOOTING & SHOOTING
AS FAST AS YOU CAN SQUEEZE THE TRIGGER!

FREE Write today! Complete Catalog Benjamin Rifles & Pistols—Single Shot & Repeaters—88 or 177 or 22. Also, Special Offer on Hunting Knives.

BENJAMIN AIR RIFLE CO. 852 MARION ST., ST. LOUIS 4, MO.

WITH EXTRA MARGIN
BENJAMIN'S Unique DOUBLE SAFETIES

Press Trigger Safety "OFF"

Release Hammer Safety as illustrated.



Freedom has a long memory

In Eastern Europe, eighty million people live with only the memory of freedom. Radio Free Europe's daily broadcasts keep this memory alive. Help preserve this sacred hope by supporting Radio Free Europe.

Send your contribution to
Radio Free Europe Fund

P. O. Box 1963, Mt. Vernon, N. Y.

Published as a public service in cooperation with The Advertising Council



**Bartlett Flying Saucer
Air Cushion Vehicle**

Quick cash profits in advertising with this unique flying machine.
Supports 300 lbs.
Build and fly \$100
Complete Plans/Details \$2.00
Write:
HERB BARTLETT
Box 66A Silverdale, Washington



ACCORDIONS UP TO 1/2 OFF

Save up to 1/2 off retail prices of comparable accordions

5-DAY FREE TRIAL

Buy DIRECT from world's Largest Exclusive Dealer! Compare our Importer-to-You prices! See how you save! Over 80 models—finest genuine Italian makes! New, easier terms! 5-Day Free Home Playing Trial with satisfaction 100% assured. Bonus Gifts Free. Rush name and address for FREE Color Catalogs and direct Importer-to-You prices—FREE. Write TODAY!

Accordions Corporation of America
2003 W. Chicago Av., Dept. P-53, Chicago 22

HELP WANTED—SPARE TIME

SENSATIONAL NEW LONGER-BURNING LIGHT BULB. Amazing Free Replacement Guarantee—never again buy light bulbs. No competition. Multi-million dollar market yours alone. Make small fortune even spare time. Incredibly quick sales. Free sales kit. MERLITE (Bulb Div.), 114 E. 32nd, Dept. C-16G, New York 16, N.Y.

GET INTO ELECTRONICS

V.T.I. training leads to success as technicians, field engineers, specialists in communications, guided missiles, computers, radar, automation. Basic & advanced courses. Electronic Engineering Technology, an ECPD accredited Technical Institute curriculum. Assoc. degree in 29 mos. B.S. obtainable. G.I. approved. Start Sept. Feb. Dorms, campus. H.S. graduate or equivalent. Catalog.

VALPARAISO TECHNICAL INSTITUTE
DEPARTMENT S, VALPARAISO, INDIANA



MEN PAST 40

**Afflicted With Getting Up Nights,
Pains in Back, Hips, Legs,
Nervousness, Tiredness.**

If you have these troubles, particularly getting up nights, then your condition may be traced to Glandular Inflammation . . . a constitutional disease. Neglect of this condition often leads to premature old age and sometimes incurable conditions.

The Excelsior Medical Clinic has a **New Free Book** that tells how thousands of men have been successfully treated here at Excelsior Springs for Glandular Inflammation by **NON-SURGICAL Methods**. They found soothing relief and a new outlook on life.

This Free Book may prove of utmost importance to you. Write Today. There is no obligation.

Excelsior Medical Clinic, Dept. B 6240, Excelsior Spgs., Mo.

ELECTRIC WELD - BRAZE & CUT

REPAIR MOST EVERYTHING MADE OF METAL



BEST WELDER MADE FOR THE MONEY! Includes full face shield, extra arc goggles, ground clamp, twin carbon arc torch, welding rod holder, supply of welding and brazing rods, solder, flux and full supplies—**PLUS ARC WELDING INSTRUCTION BOOK! ONE YEAR GUARANTEE—10 DAY FREE TRIAL.** Now you can

make or repair metal parts for cars, home, farm, garden, shop or factory. Works on any 110 v. house plug-in. CUT, MELT, BRAZE, SOLDER OR WELD MOST ANY METAL! **SEND ONLY \$2.00** (cash, ck, mo) and pay postman only \$12.95 (OD) postage or send \$14.95 for postpaid delivery. Every EXPERIMENTER, MECHANIC, INVENTOR, CAR OR HOME OWNER NEEDS THIS SMALL WELDER. ORDER YOURS NOW! Ideal gift. MADE ONLY BY: Midway Welder Co., Dept. DPS-5, Kearney, Nebr.



HUNT YEAR 'ROUND



Enjoy new thrills of hunting! At last an inexpensive way to capture game without harm. If it is closed season you can release it, if it is a pest you can destroy it! Also handy for personal protection.

ORDER BY MAIL — USE THIS COUPON —

TEAR GAS GUN OUTFIT

This all-steel, .22 cal. TEAR GAS gun shoots 6 times as fast as you can pull the trigger. Also fires blanks for alarm or dog training. Complete with 6 tear gas shells and instructions.

BLUE STEEL\$ 9.98

CHROME\$ 11.98

"GAME FLUSHER" PENS

This handy size chrome pen shoots the new powerful .38 spec. MAGNUM cartridge. Will flush game out of the deepest holes. Powerful enough to even stop a Bear!

Complete with 2 shells . . . \$9.98

Same as above in .22 caliber with 3 shells . . . \$4.98

- | | | |
|--------------------------------------|--|---|
| <input type="checkbox"/> Gun \$9.98 | <input type="checkbox"/> Pen \$9.98 | <input type="checkbox"/> .38 Shells .75 ea. 20 for \$13.50 |
| <input type="checkbox"/> Gun \$11.98 | <input type="checkbox"/> Pen .38 Cal. 2 shot \$11.98 | <input type="checkbox"/> .22 Shells .15 ea. 100 for \$13.50 |
| <input type="checkbox"/> Pen \$4.98 | <input type="checkbox"/> Gun Holster \$2.00 | <input type="checkbox"/> .22 Blanks 100 for \$1.25 |

TEAR GAS DEVICES CO., ST. LOUIS 22, MISSOURI

Rush!
Enclosed is check.
(No. C.O.D.'s)

NAME _____
ADDRESS _____
CITY _____ ZONE _____ STATE _____

Dealers—Agents Inquire

"TOOK IN \$217 FIRST 10 DAYS"

Some make more, some less . . .

**We help you to start Your
Own All-Year Business**

Make Big Money! With our easily operated, highly efficient Wall Washer, Charles Stelle took in \$217 in first ten days. E. L. Goss took in more than \$10,000 in one year. G. H. Jones wrote, "I made a net profit of \$1200 on one job." And



no wonder—this machine washes walls 6 times faster and better than by hand and with no mess—no drop cloths needed.

Your Money-Making Opportunity • We want more men to go into this profitable business for themselves and enjoy independence—freedom from layoffs and bosses. Customers everywhere—homes, offices, schools, churches, hotels, etc. How much you earn depends largely on you, but we help you to start and work with you for your success. What you take in is mostly profit. No need to rent shop or office; operate from home. Can start spare time until your full time is justified.

OURS IS NOT A LEASE ARRANGEMENT • You are free to operate in an independent manner. You sign no contract. You own the detergent outright and are always your own boss . . . and every dollar you take in is yours to keep. You pay no fees, or dues, or royalties to anyone. And you take no risk. Your detergent is fully guaranteed and enough supplies come with it to return far more than your investment. Many earn the cost of the detergent in a week or two. It costs nothing to get the details . . . write TODAY.

Lose No Time—Send Coupon Today for All the Facts

FREE BOOK! MAIL COUPON TODAY!

• **VON SCHRADER MFG. CO.**

• 511 "W" Pl., Racine, Wisconsin

• Send at once (no obligation) your **FREE** booklet containing information about your **WALL WASHING MACHINE** and how I can start my own permanent, profitable business.

• Name _____

• Address _____

• City _____ Zone _____ State _____

Train Now For BIG Pay Jobs!

**EARTHMOVING
EQUIPMENT
OPERATOR**

**HEAVY EQUIPMENT
REPAIR-REBUILDING**

**Greer
TECHNICAL INSTITUTE**

Allen. S. E. Hutch, Box 368, Braidwood, Ill.

Get ready for a man's job in the booming road and construction industry. Operate cranes, "dozers," earth-movers, etc. Train "on the job" in 5 to 13½ weeks. Classes start weekly; reserve space now. Approved for vets. Complete catalog and reservation facts **FREE**. Write today!

Detroit report

By Devon Francis

Chevy goes hot

At last Chevy has dropped its bombshell. For months the Detroit rumor mills had been cranking out stories about a new supersuper-stock V-8 engine under development at Chevrolet. Until now, Chevy's biggest engine had been a 409-incher, while Dodge and Plymouth had a 426 and Ford and Pontiac 427s.

At the recent Daytona Beach stock-car races, five Chevy 427-inch engines were fielded. During practice runs they burned up the track at lap speeds of up to 168 m.p.h. But mechanical troubles seemed to plague them all. None finished higher than ninth place.

Chevy is releasing no information, but a glance at the engine compartments in Daytona fetched some educated guesses. The intake manifold is unusually high, indicating a tuned system. Tuning works on the principle of a pipe organ. The passages from carburetor to intake port are of a length to set the fuel charge vibrating at a specific pitch. This builds up the momentum of the charge and gives a supercharging effect—ideally delivering the charge to the intake port just as the valve opens. The longer the passages, the lower the r.p.m. range at which the system has the greatest effect.

Exhaust headers on the new engine have individual branches from each port, and probably are also tuned. Another aid to breathing: Cool outside air is rammed through the heater plenum to the engine.

The block appears shorter than that of the 409. The heads, too, look new. The extreme width of the head covers and the side mounting of the spark plugs indicate an unusual rocker-arm configuration. There's a good chance that modified-polysphere (flattened-hemisphere)

combustion chambers and slightly inclined valves are used.

Washing machine, begone!

The gas-turbine engine in Chrysler Corp.'s coming Typhoon car will be quite different from the experimental turbines that Chrysler has demonstrated for these several years. In contrast to the "washing-machine" look of the prototypes, the production engines will be smaller and less odd-looking. Producing about 130 hp., the engines will have a "recuperator," or regenerator, on each side to recover waste heat and give added fuel economy.

Despite the slightly smaller size, the turbine's shape will require the substitution of coil springs for torsion bars in the front suspension. Side panels on the car will be smooth, and the silhouette like the Thunderbird's. There will be four bucket seats. Exhaust pipes will be pretty well hidden. They have been rather prominent on previous Chrysler turbine automobiles.

Cars by computer

Something has been going on for months at General Motors that is going to have a pronounced effect on the speed with which automobiles are improved and changed. Two dozen technicians from International Business Machines this month will complete the installation at the GM Tech Center in Warren, Mich., of one of the world's largest complexes of electronic computers and subsidiary equipment.

What have computers got to do with car design? Plenty. The revolutionary change in U.S. motorists' car-buying habits in the mid-Fifties convinced top GM executives that their system of planning for the future lacked flexibility: It took almost three years to get the first GM compacts on the production line.

The computers, to be used in engineering, styling, and research, will cut development time on a new model from 3 years to 12-18 months.



AUTOLITE-POWERED FORDS SWEEP DAYTONA 500

At Daytona, 500 miles is an eternity that lasts 3 hours, 17 minutes and 56 seconds. Engines blow, brakes fail, parts shatter without warning in this grueling test of durability.

It is a matter of record that the first five finishers, all '63 Fords, were equipped with Autolite Spark Plugs. In fact, thirty-eight of the 50 entrants in the "500" started with Autolite Spark Plugs in their cars.

Why? Tiny Lund received \$24,600 for his first-place effort in the Daytona 500. When you go for this kind of money, you don't take chances you don't have to. Tiny didn't. Drivers like Fred

Lorenzen, Ned Jarrett, Nelson Stacy, Dan Gurney didn't either.

Autolite Spark Plugs have won more stock car competitions in the past year than all other makes combined for one simple reason. The men who make their living behind the wheel put them there, no matter what make of car they drive.

A faulty spark plug will probably never cost you \$24,600 as it could have cost Tiny Lund. But it costs just the same. Why not take a tip from the men who can't afford to make mistakes? Try a set of Autolite Spark Plugs in your car. The track-bred, track-tested spark plug that doesn't know how to quit.

PRODUCTS OF  MOTOR COMPANY

SPARK PLUGS • BATTERIES • SERVICE PARTS
 **AUTOLITE**
 THE NAME TO REMEMBER WHEN YOU CARE FOR YOUR CAR

Copyrighted material

Popular Science *90, 60, and 30 years ago...*

1873 "English will become the dominant language of the world in 50 or 100 years, according to M. Alphonse de Candolle. It will be the one into which the important scientific publications will be translated. It is not only that the English-speaking population will outnumber the German and French, but that the language has peculiar merits. When people are in a hurry and want to say something quickly, it is more easily said in English.

"Our sentences don't even have to be finished to be understood, because the construction is not roundabout. The leading ideas come first."

"Prof. Leidy believes that contagion is frequently transferred by the agency of the common house-fly. His observations in military hospitals have led him to conclude that flies should be carefully excluded from wounds, particularly if gangrene is present."

1903 "At a meeting of the French Academy of Sciences MM. Curie and Laborde announced a new property of radium—its salts emit heat. Radium already possesses the power of giving out light perpetually, it can emit rays that penetrate solids, it acts on sensitized plates, and causes air to conduct electricity.

"The source of energy of the rays is a mystery. Rutherford and McClung suggest that it is due to the breaking down of atoms into smaller particles which constitute the radiations."

"The interest in the story of Helen Keller is many-sided. Born June 27, 1880, at Tuscumbia, Ala., the child was deprived of both sight and hearing by a serious illness at 18 months.

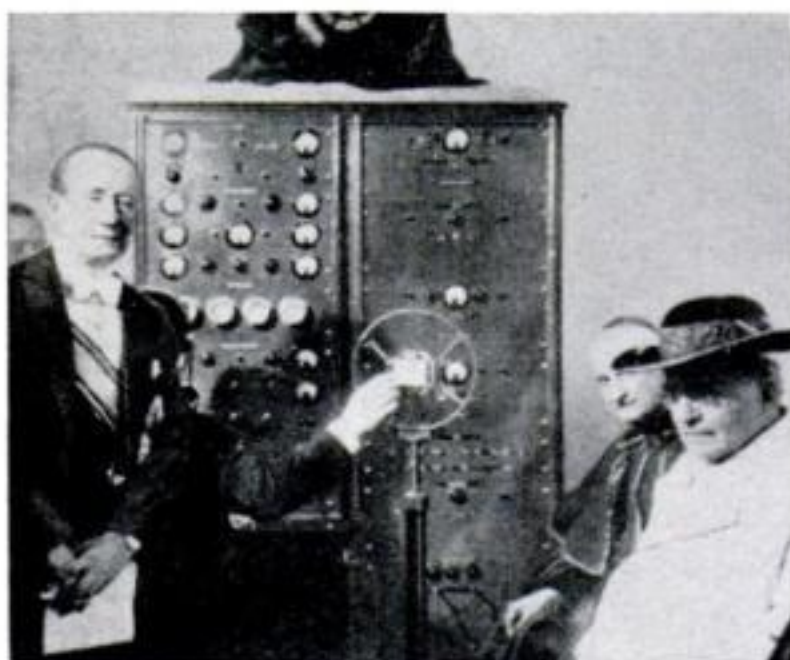
"It was through Charles Dickens' account of Laura Bridgman that Mrs. Keller became acquainted with the possibilities of education for Helen. On Mar. 3, 1887, Miss Anne Sullivan came to take charge.

"Miss Sullivan's first aim was to reveal to the infant mind the potency of a word. After some weeks, she relates:

"We went to the pump-house, and I

made Helen hold her mug under the spout while I pumped. As the cold water pumped forth, I spelled w-a-t-e-r in Helen's free hand. The word coming so close upon the sensation seemed to startle her. She dropped the mug and stood as one transfixed. She spelled w-a-t-e-r several times. All the way back to the house she was highly excited, and learned the name of every object she touched so that in a few hours the child had added 30 new words to her vocabulary."

1933 "An ultra-short wave radio has been installed at Vatican City, Italy. According to its noted designer, Guglielmo Marconi, it represents 'the first practical application of microwaves.' These waves, only 21 inches long, are a minute fraction of those used in ordinary broadcasting. They may be focused directly at the receiving station like a beam of light. The radio will be used to communicate between the Vatican and Castel Gandolfo, 20 miles away."



Marconi, left, and Pope Pius XI, right, inaugurate new microwave radio system.

"Wrapping milk or cream in paper is the unusual feat performed by a new machine for dairies. In one continuous operation the device forms a container from paper, dips it in molten paraffin, cools it, fills it with milk, and seals it. A consumer receives a boxful of milk untouched by human hands in the packaging."

SCOUT is the registered trade mark for a vehicle manufactured exclusively by International Harvester Company.



The SCOUT helps earn get-away money...



and takes you where the sport is

You can keep the SCOUT busy all week earning money for you: hauling tools, equipment, merchandise or people. Pushing, pulling, winching heavy loads, or plowing snow.

Then go anywhere with the SCOUT. The same 4-cyl. 93 hp. COMANCHE® engine that worked all week for pennies (with rear-wheel or all-wheel-drive) will make play out of woods and fields. The Scout's frame stands up to the jolts of rough terrain.

Full-length tops in steel or vinyl enclose 78½ cu. ft. of play-or-pay-load space . . . or choose a hard or soft top for the cab. If you want to go sportier, you can get a four-passenger bucket seat model.

There's all sorts of special equipment to keep your SCOUT busy the year around. So for the vehicle you can enjoy every day at work or play, get the SCOUT. See your INTERNATIONAL Dealer or Branch.

THE
Scout
BY INTERNATIONAL® 
International Harvester Company



***Pall Mall's natural mildness
is so good to your taste!***

*You can light
either end!*

***So smooth, so satisfying, so downright
smokeable!*** For flavor and enjoyment you just
can't beat Pall Mall's natural mildness. It's so good
to your taste. Never too strong. Never too weak. Al-
ways just right! Enjoy satisfying flavor... so friendly
to your taste. ***Outstanding... and they are Mild!***

COMPARE ALL THREE!



Smoke "traveled" through
fine tobacco tastes best.
Pall Mall's famous length
travels the smoke naturally
... over, under, around and
through the finest tobaccos
money can buy. Makes it mild
but does not filter out that
satisfying flavor!



REPORT FROM THE DRIVER'S SEAT

Popular
Science
Monthly
REG. U. S. PAT. OFF.



Five sizzlers in the U. S. small-car field were put through their paces. Above: Pontiac Tempest.

Popular Science Tests the Hot Compacts

By Devon Francis and Alex Markovich

ECONOMY was the word back in the fall of 1959 when the first covey of U.S. "compact" cars was introduced. And, as "economy" vehicles, they were shamelessly fashioned to compete with a growing flood of little cars from Europe.

In number, counting American Motors' already existing Rambler, there were four of them. As befitted automobiles of modest pretensions, they were relatively cheap, relatively small, and delivered relatively modest performances.

Since then, the list has grown. Now there are 10 U.S. compacts, and it is time to take note that some of them have been gradually growing out of their britches while nobody was looking. This is less a matter of physical size (though some are inches longer) than it is of price and performance.

They are flossier. They are heavier. They

CONTINUED



SPYDER



SPRINT



JETFIRE



TEMPEST



SUPER LARK

are becoming expensive. But the real index to their change of character lies in their power. No longer are they compacts when the light turns green. In horsepower-for-weight, they challenge and excel quite a passel of bigger cars.

To see what's happened to U.S. compacts as of this bright green spring of 1963, POPULAR SCIENCE decided to test them out. We put flow meters on their fuel lines. We put stopwatches on their accelerations. We slewed them around sharp corners to see how they rode and handled. We stood on their brakes at 80 miles an hour.

The results of these tests are shown in the chart at right and in the descriptive passages of this article. The chart also gives the vital statistics.

We chose five cars—the Corvair Spyder, Falcon Sprint, Olds Jetfire, Pontiac Tempest, and Studebaker Super Lark. These cars are all special models, or incorporate special options. Lower-powered and less costly versions of each of these cars still remain the manufacturers' standard offering.

Not chosen were the Rambler or its sister, the American, the Plymouth Valiant, Mercury Comet, or Buick Special. By its own testimony, American Motors is not in the performance business (although a smaller version of its Ambassador V-8 engine has drifted down to its Classic). The Valiant remains essen-

CONTINUED

MODEL
FACTORY-SUGGESTED PRICE (A)
ENGINE: TYPE
CARBURETION
HP. @ R.P.M.
TORQUE (LB.-FT.) @ R.P.M.
BORE & STROKE (IN.)
DISPLACEMENT (CU. IN.)
COMPRESSION RATIO (:1)
WEIGHT (LB.) PER HP.
ENGINE REVS. PER MILE
PISTON TRAVEL PER MILE (FT.)
FUEL REQUIRED
FUEL CAPACITY (GAL.)
CRANKCASE CAPACITY (QT.)
TRANSMISSION TYPE AND RATIOS (:1) (D)
AXLE RATIO (:1)
STEERING RATIO (:1) AND TURNS LOCK TO LOCK
BRAKE SWEEP AREA (SQ. IN.) AND MATERIAL USED
TIRE SIZE
WHEELBASE (IN.)
TRACK: FRONT AND REAR (IN.)
GROUND CLEARANCE (IN.)
CURB WEIGHT (LB.)
WEIGHT DISTRIBUTION: FRONT AND REAR (%)
OUTSIDE DIMENSIONS: OVERALL LENGTH (IN.)
WIDTH (IN.)
HEIGHT (IN.)
ACCELERATION: 0-60 M.P.H. (SEC.)
40-60 (H)
50-70 (H)
TOP SPEED
MILES PER GALLON: 30 M.P.H.
40
50
60
SPEEDOMETER ERROR @ 60 M.P.H. (%)
ODOMETER ERROR (%)

NOTES

All acceleration times and gas mileages are given in true m.p.h.
N.A.—Not announced. (A) Includes federal excise tax but no



Testing equipment on all cars included a fuel meter to measure economy, and an accurate fifth-wheel speedometer. That's Automobile Editor Devon Francis behind Sprint's wheel. With just over 600 miles on the odometer, car was still stiff. A well-broken-in Sprint should do markedly better in fuel economy, acceleration, and top speed.

CORVAIR SPYDER	FALCON SPRINT	OLDS JETFIRE	TEMPEST LE MANS	STUDEBAKER SUPER LARK
MONZA COUPE	2-DOOR HARDTOP	SPORTS COUPE	2-DOOR HARDTOP	2-DOOR SEDAN
\$2,931.35	\$2,624.60	\$3,500.82	\$2,660.80	\$3,146.90
6	V-8	V-8	V-8	V-8
1-BBL. (B)	2-BBL.	1-BBL. (B)	4-BBL.	4-BBL.
150 @ 4,400	164 @ 4,400	215 @ 4,600	280 @ 4,800	300 @ 5,000 (C)
210 @ 3,200-3,400	258 @ 2,200	300 @ 3,200	355 @ 3,200	N.A.
3.4375 X 2.6	3.8 X 2.87	3.5 X 2.8	3.72 X 3.75	3.56 X 3.62
145	260	215.5	326	289
8.0	8.7	10.25	10.25	8.5
16.8	17.7	13.4	11.7	10.5
3,066	2,790	2,821	2,400	2,679
1,329	1,340	1,317	1,889	1,619
P	R	P	P	P
14	14	16	20	18
4	4	4	4	5
4-SPD. MANUAL 3.65-2.35-1.44	4-SPD. MANUAL 2.73-2.04-1.51	4-SPD. MANUAL 2.54-1.92-1.51	3-SPD. MANUAL 2.94-1.68	4-SPD. MANUAL 2.54-1.92-1.51
3.55	3.25	3.36	3.90	3.54
23.5-4.6	27-4.64	25.8-5.2	23.6-5.25	28-24-28 (E)-4.7
197.7 SINTERED METALLIC (F)	251.3 MOLDED ASBESTOS	224 MOLDED ASBESTOS	197.9 MOLDED ASBESTOS	377 (G) MOLDED ASBESTOS
6.50 X 13	7.00 X 13	6.50 X 13	6.00 X 15	6.70 X 15
108	109.5	112	112	109
54.5-54.5	55-54.5	56-56	57.3-58	57.3-56.5
6	6.3	5.79	6	5.8
2,527	2,910	2,884	3,264	3,140
35-65	57-43	55-45	54-46	58-42
180	181.1	192.2	194.3	184
67	70.6	73.7	74.2	71.2
51.5	53.2	52.3	54.2	55.7
13.1	11	9.1	8.1	8.4
7.0	6.8	5.3	4.0	5.1
8.6	8.1	6.5	4.7	5.1
113	105	115	115	132
30.9	22.5	29.2	22.6	15.7
30.1	22.1	25.8	21.4	13.9
27.4	20.4	21.9	16.7	12.7
24.9	17.1	19.3	14.3	12
+ 5	+ 2.5	4.2	3.6	+ 2.8
+ 4.1	0	+ 1	+ 1	+ 4

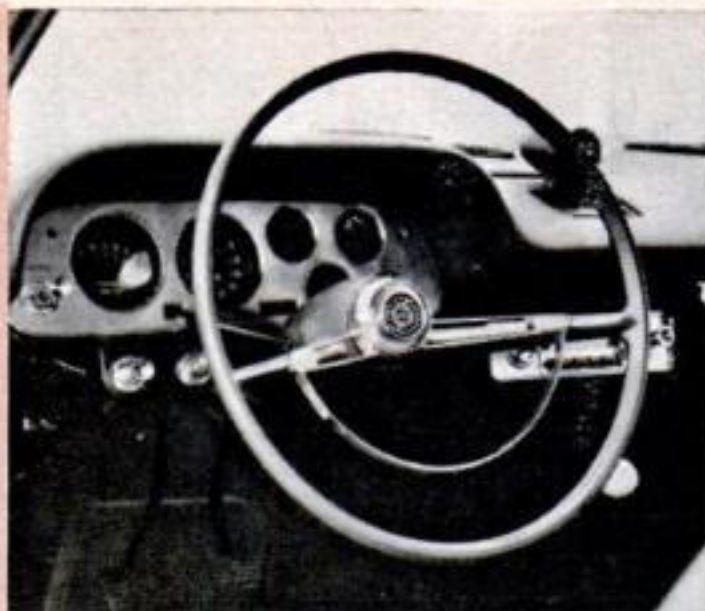
state or local taxes or dealer preparation charges. (B) Special design, not comparable with conventional carburetor. (C) Estimated; actual not announced. (D) First three gears (first two

for Tempest); high gear 1:1. (E) Variable ratio, high in center, slower as locks are approached; (F) Optional equipment. (G) Disks in front. (H) Timing includes downshifts.

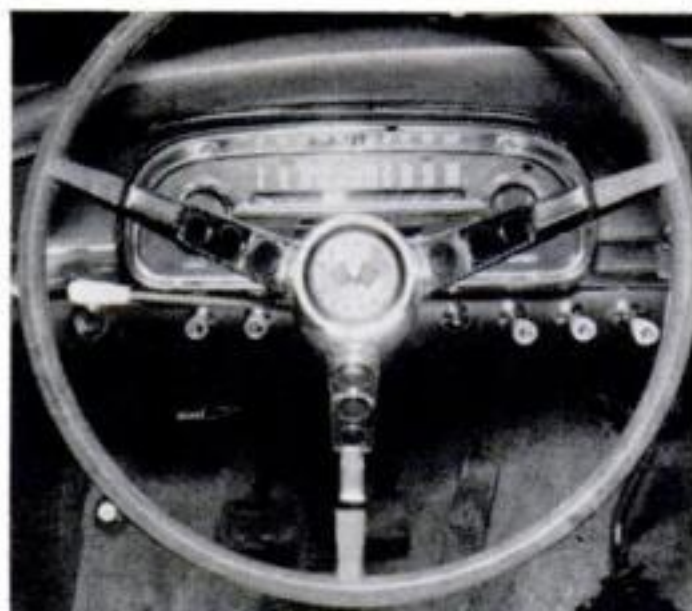
Fifth wheel is lowered for Tempest test runs by Alex Markovich as Pontiac engineer Dean Bedford Jr. points out the release bolt. Wet, slippery roads proved damaging to the Tempest's acceleration figures because of the tremendous torque its V-8 develops. Despite some feather-footing of the accelerator, rear-wheel spin' remained a problem.



Legible gauges are important on high-performance cars. The Lark's dashboard layout is the best. It has a full array of instruments, no idiot lights. Gauges are round, and white-on-black graduations are easy to read. Two of the five cars—Sprint and Jetfire—have hard-to-read horizontal speedometers.

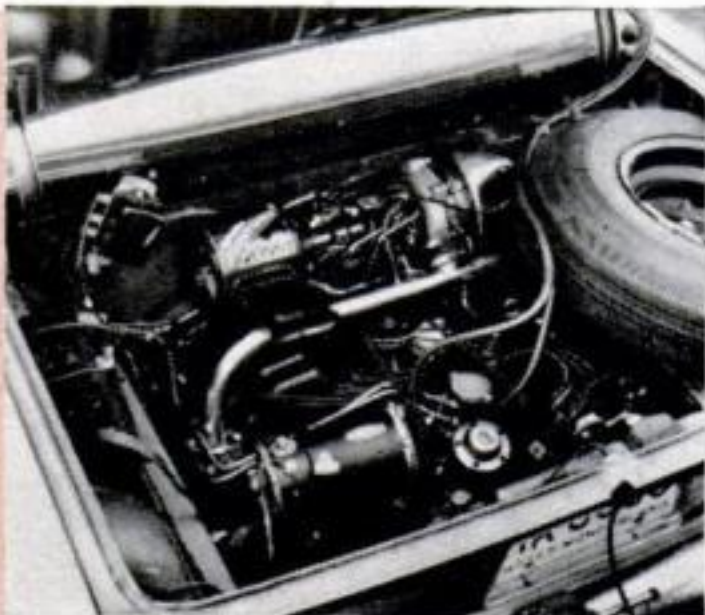


SPYDER



SPRINT

Crowded engine compartment is penalty paid for extra horses. The three blower installations resemble beds of snakes. The Falcon V-8 is crammed in where a modest six normally lives, and the Tempest V-8—big enough for a standard sedan—occupies a spot designed for a small aluminum V-8 or in-line four.



tially unchanged in power. While Buick's Skylark on the Special chassis boasts 200 hp., it has not been publicized as a performance compact. The Comet Sportster (with V-8) substantially duplicates the Falcon.

The five cars chosen, the truly hot compacts, bear fresh designations to

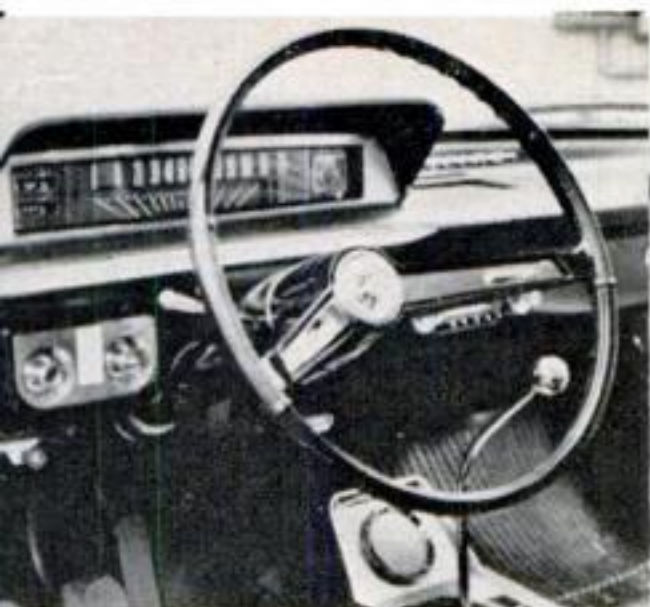
distinguish their muscularity from that of their forebears. The Spyder is the Corvair; the Sprint, the Falcon; the Jetfire, the F-85; the Le Mans, the Tempest; the Super Lark, the Lark.

As a reminder, the basic horsepower of these automobiles at their introduction were: Corvair, 80; Falcon, 85; F-85, 155; Tempest, 110; Lark, 90. For the Corvair, Falcon, and F-85, these horsepower are still offered. The lowest horsepower for the Tempest is now 115; that for the Lark, 112.

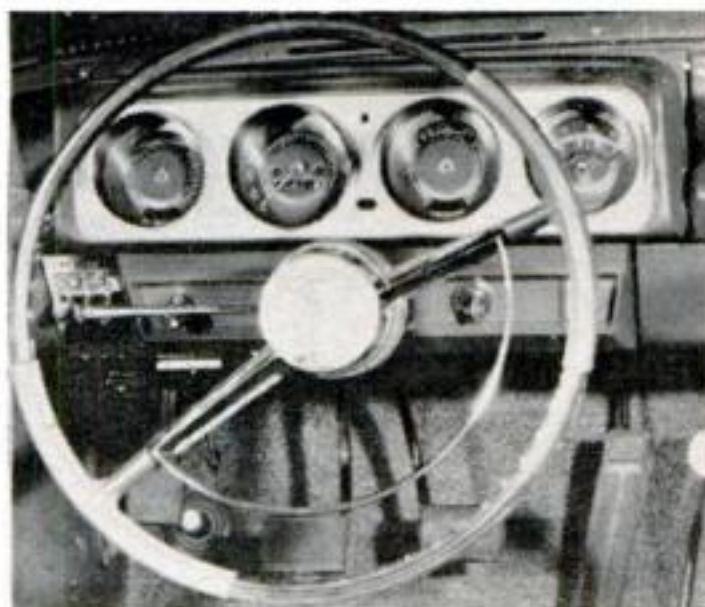
In engine design, the five hot compacts offer considerable contrast. Two schools of thought rule the automobile industry's engine engineers' doodlings. One believes that the easiest path to power is the big, "freely aspirated" engine, with cylinders opened up to great draughts of air and fuel from the carburetors. The adoption by the industry of the four-barrel carburetor—in some instances two four-barrel carbs or three two-barrels—is an example. The other school of thought runs to superchargers and turbochargers, cramming compressed



A vacuum gauge for horsepower can be mighty useful, but not as it's marked in the Jetfire. There are no graduations—just two markings, one for "economy," one for "power."



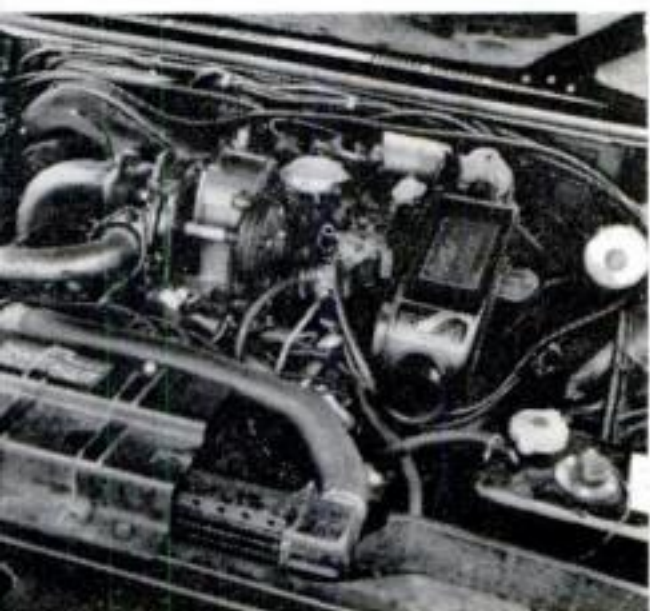
JETFIRE



TEMPEST



SUPER LARK



air and gas into the cylinders of a relatively small engine.

Today's hot compacts include two with freely aspirated engines: the Falcon Sprint and Tempest Le Mans. One, the Super Lark, is mechanically supercharged; and two, the Corvair Spyder and Olds Jetfire, get compressed air and fuel through blowers driven by turbines in the exhaust stream. The Sprint is limited to two barrels as a fuel-economy measure.

One engine in the five, that of the Spyder, is a flat six. The others are V-8s.

The axle ratios in the five cars tested were, in general, low (numerically high)—they were not geared for gas economy and top speed. Their goal: acceleration.

All the cars were the latest thing in automotive high fashion. They were gaudily trimmed, bucket-seated, and fitted—except for the Tempest—with fully synchronized manual four-speed transmissions. The Tempest carried a three-speed manual synchronized in second and third.

Finally, POPULAR SCIENCE's tests on

the Tempest, Spyder, and Super Lark were run on rain-slick pavements. This could account for any disparities between our results and those obtained from the Pure Oil tests [see "Keep-'Em-Honest Car Test," April].

Here are the reports, car by car:

Corvair Spyder

Though what makes the Spyder the Spyder is a turbocharger, a \$10.80 option on our test car stole the show. This is the factory-installed heavy-duty suspension, consisting of stiffer springs and shocks (and built-in negative camber on the rear wheels). The result: greatly improved cornering.

At low speeds, Corvairs (with either standard or heavy-duty springing) are understeerers—they require more than normal wheel turning to get around a corner. This is the result, despite a tail-heavy weight distribution, of specially designed suspension geometry and an unusually wide spread between front and rear tire pressures.

[\[Continued on page 188\]](#)

Why Sports Records Are Being Broken:

SCIENCE OR SUPERMEN?



Why pole vaulters are soaring 16 feet



Fantastic flexibility of new fiber-glass pole is shown at right as Marine Lt. Dave Tork "rides" it just before being "whipped" over the barrier at a recent Los Angeles meet. The multi-exposure photo at left of a vaulter in action shows rigidity of a metal pole, with bend almost imperceptible.



Today's athletes are running faster, jumping higher

By Robert Gannon

IT WAS called the Magic Number, and they had talked about it for a century. Eighteen years ago, Sweden's Gunder Haegg almost hit it—the four-minute mile—but missed by just under two seconds. Then in 1954, Roger Bannister of Great Britain broke the four-minute barrier.

Once cracked, a less-than-four-minute mile became almost commonplace. Last August, on a notoriously slow track (London's White City Stadium), five men sped a mile in less than four minutes in

a single race.* By 1963, the barrier had been punctured outdoors at least 89 times by 35 men from 14 nations.

Other once-insurmountable sports records are crumbling like sand castles. Today's athletes jump higher, swim faster, throw farther, and score more points than ever before. Not a single men's Olympic or world track-and-field record is more than a dozen years old. Many more will fall before the year ends.

The reasons, say athletes, sports writ-

*The milers: Jim Beatty and U.S. teammate Jim Grelle, both at 3:56.5; England's Stanley Taylor and America's Bob Seaman, both at 3:58; and England's Michael Berisford at 3:59.2.



and broader, throwing farther. Here are some of the reasons

ers, and coaches, seem to number five: more competitors, bigger participants, better training, finer techniques, better equipment.

More competitors

This is probably the biggest single factor in current record crumbling. More of us are around today with more time to play. Children learn sports earlier (Arnold Palmer, three-time Masters champion, took to the golf course at the unlikely age of four); many schools have better physical-education programs; potential champs are spotted earlier, given

more training when they're younger.

And champs are keeping at it longer. Shot-putter Parry O'Brien says, "It used to be only in isolated cases that a track-and-field athlete continued to compete after 30, but now there are whole handfuls of them." O'Brien, now 31, is still competing more than 10 years after winning his first Olympic Gold Medal.

Bigger participants

We perform bigger feats because we are growing larger all the time. Americans today are about an inch taller than their fathers and 12 pounds heavier,

Bigger men, better equipment and training, add up to new



Breaking his own 1961 record by half an inch, Russian high-jumper Valery Brumel clears the high bar at 7 feet, 4 inches in this year's meet of the N. Y. Athletic Club in Madison Square Garden. Unlike vaulters, jumpers have to "do it yourself." Russian coach Gabriel Korbke says, "We are interested in developing men, not implements."

mainly because of better nutrition and reduction of childhood disease.

Taller men mean longer legs. Runners can reach farther back, can span longer distances without tiring.

Heavier men mean thick arms and wide hands, which swing golf clubs harder and more accurately. Bobby Jones, legendary golfer of the 1920s, drove 240 yards, in his prime. But wide-handed, beef-shouldered Jack Nicklaus, present U.S. Open champ, commonly drives the ball 260 yards, sometimes tops 325.

Long bodies mean that basketball players can spring up head-level with the basket, prime reason for today's sky-high scores. Wilt Chamberlain, the 7-foot, 1-inch San Francisco Warrior, averages 42 points a night, has made 100 in a single game. His father's height: 5 feet, 8 inches.

You don't *have* to be big to be a champ, of course. But if you aren't you'll probably have to work that much harder—which leads to the third big reason for record breaking:

Better (and more intensive) training

Jim Beatty stands only 5½ feet, weighs but 128 pounds. Yet he's the fastest American miler ever. One reason is that he runs about 100 miles a week. He

works until his body pains. "Have you ever had to run so hard up a long flight of stairs," he asks, "that your thighs begin to hurt?"

Or look at 19-year-old Bruce Kidd, named Canada's outstanding athlete for 1962. He runs up to 20 miles a day, often competes in two or three events in a single meet. "And if he can stay with it," says Daniel J. Ferris, secretary emeritus of The Amateur Athletic Union, "he'll undoubtedly become the greatest distance man in history."

Hard work and good coaching will continue to turn out good runners. According to William J. Bowerman, head track coach at the University of Oregon, "The ability to run a mile under four minutes is possessed by thousands of Americans. . . . Any man who can run a half-mile in 2:30 is a prospect." But he has to be trained—hard.

To temper the hard work and incessant training, most coaches advocate short periods of repose, alternating with periods of tremendous physical strain. Carried to the limit, this idea distills to an exercise method called *isometric contraction* (IC), newly rediscovered by coaches and participants of all sports—football (the '49ers use it), baseball (the Pittsburgh Pirates), high jumping (Bob Avant), or weight lifting (Louis Riecke).

sports records

Beating the four-minute mile in the U.S.: The three runners in front at right all made it. This barrier, first broken by England's great Roger Bannister in 1954, has now been pierced at least 89 times by runners from 14 countries. Jim Beatty, winner here at 3:57.9, has bettered this time by setting a record of 3:56.5 in England.



IC simply is pushing against buildings, squeezing stones, lifting trucks. The object is to strain for a few seconds against an immovable object—the opposite to calisthenics, or *isotonic* contraction, where muscles do real work.

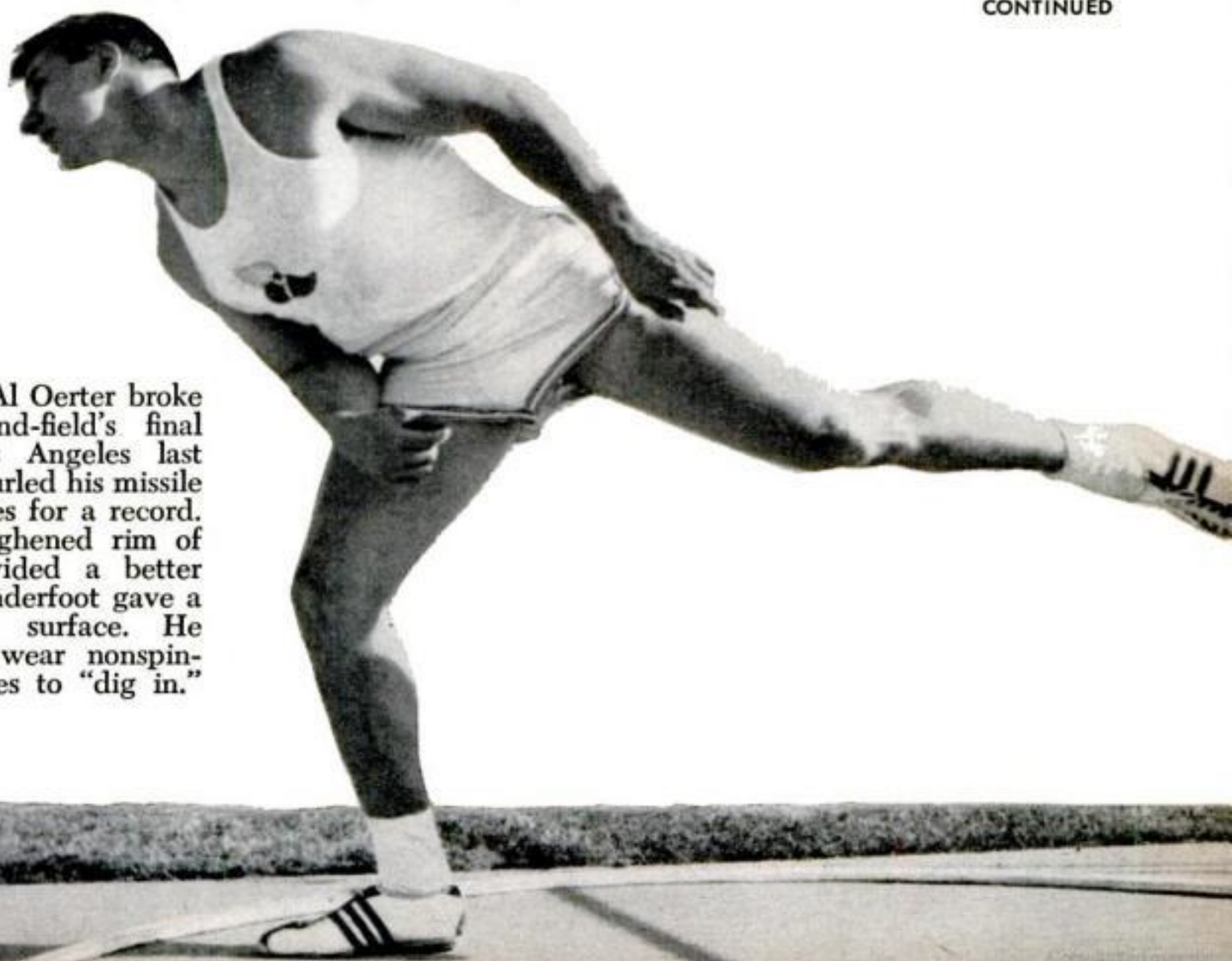
Key to exercise without movement is a single intense strain rather than a series of light contractions. Experts recommend a major pull or push for about 10 seconds, say that the average man can increase his lifting power 100 per-

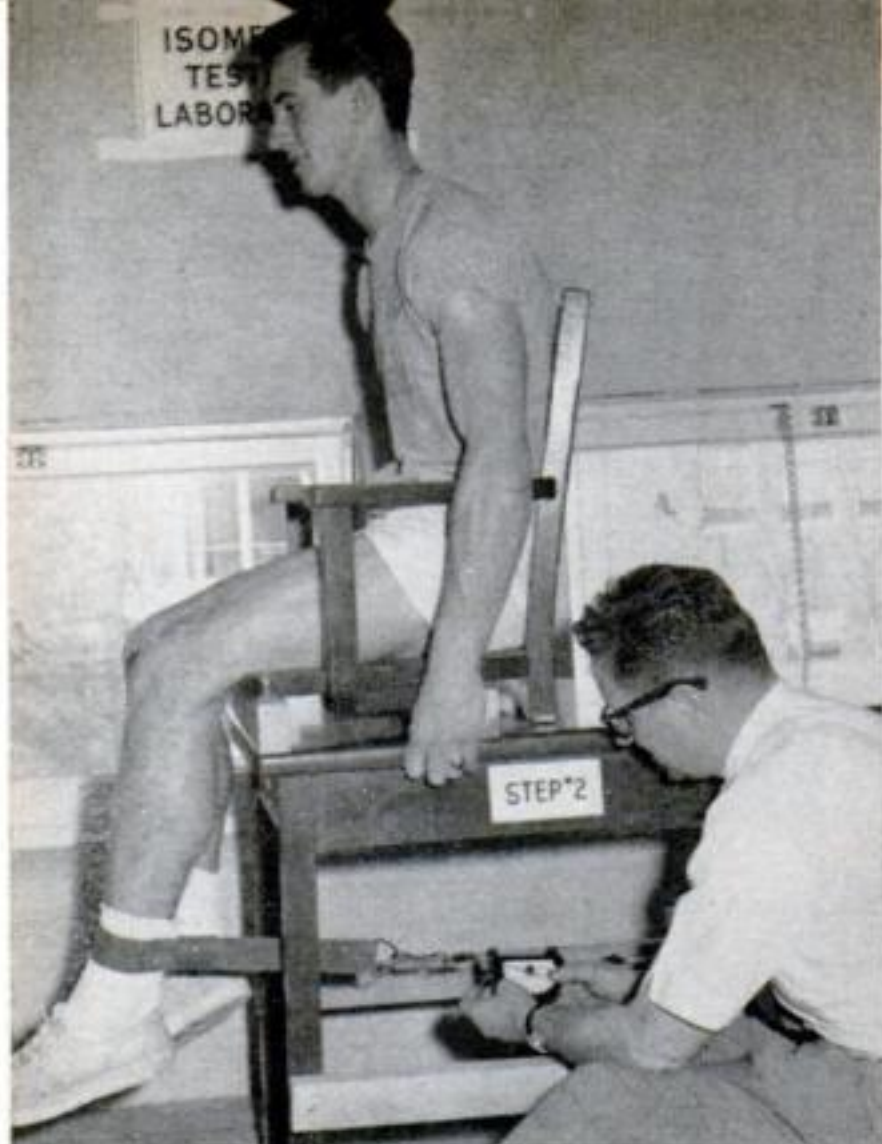
cent in a 20-week period, contracting hard just once a day.

One booster is Bob Hoffman, Olympic weight-lifting coach and publisher of *Strength and Health* magazine. Says he: "I'm absolutely awestruck at the miracles it has wrought." So sure is he of the effectiveness of IC that he has designed and is selling a stationary bar that can be set at various heights to help in a workout. Can't damage furniture that way.

CONTINUED

Discus thrower Al Oerter broke one of track-and-field's final barriers in Los Angeles last June when he hurled his missile 202 feet, 2 inches for a record. His secret: Roughened rim of the discus provided a better grip; concrete underfoot gave a better whirling surface. He didn't have to wear nonspinning spiked shoes to "dig in."





Isometric muscle-contraction exercises condition takeoff leg of Fairleigh Dickinson high jumper, Ray Bury. After seven weeks of IC training, his jump height increased $3\frac{1}{2}$ inches.

"I once pulled a washbasin out of the wall," claims Hoffman.

The exercise does develop muscles, but as Dr. Arthur H. Steinhaus of Chicago's George Williams College points out, "It does nothing for the heart or lungs; it does not increase endurance . . . only strength."

Finer techniques

This is the fourth major reason for today's crumbling records. A slight change of style can often shave important seconds, stretch vital inches, add a point or two.

When hurdlers learned that they travel faster on the ground than in the air, they practiced stepping over the barriers straight-legged, snapping the trailing leg over fast and touching the ground as quickly as possible. Result: broken records.

In swimming, more than 100 men today can beat Johnny Weismuller's 100-yard record of 51 seconds. They're using fast flip turns he never thought of.

And today's major-league pitchers have completely eliminated the .400 hitter, and have even about squelched the .350

man. Reason, according to Stan Musial: "Every pitcher you face has the slider" (a fast ball that breaks a few inches lower on the bat, near the handle). "Very few pitchers had it when I came up to the majors."

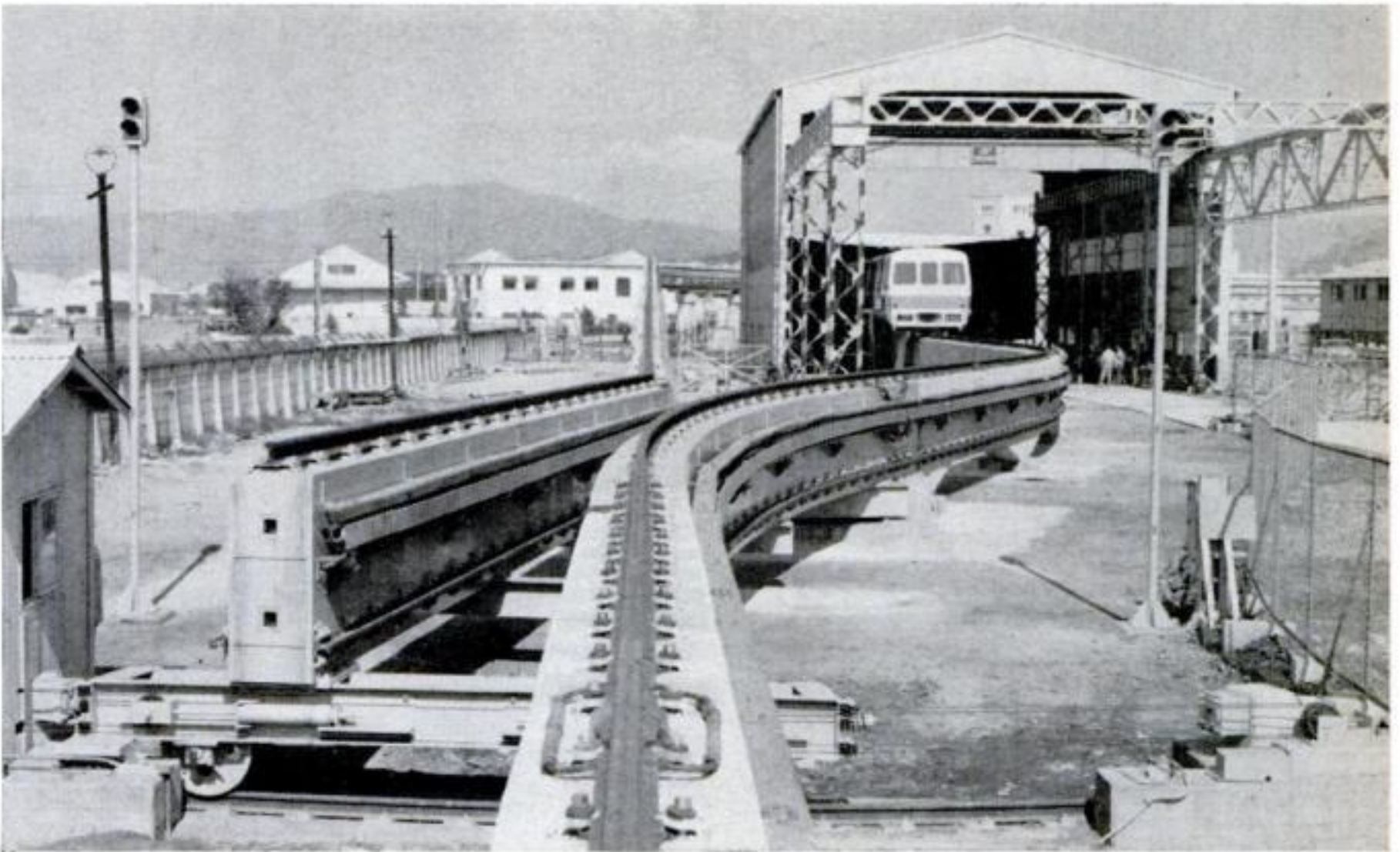
High jumpers used to use the "scissors" technique almost exclusively, clearing the bar in a seated position. But they found that by going over flat on their bellies in a western roll, the center of gravity lowered significantly, making it that much easier. Now something new may be coming. Bob Avant, an unorthodox springer, leaps head first and clears seven feet with ease. Before Avant, almost nobody believed it could be done that way. Now others are eyeing the technique.

In broad jumping, the secret used to be top speed and top height, with the legs out straight; distance would take care of itself. But Ralph Boston, a little-known Tennessee State University jumper, didn't agree. After he solidified the technique of what he calls walking in the air—"I take $3\frac{1}{2}$ steps before I land"—he easily bettered Jesse Owens' 25-year-old world record (26 feet, $8\frac{1}{4}$ inches) by a half-foot.

Few field events can match the pole vault for change. In 1937, Sabin Carr made a sensational leap: 14 feet. Afterward, he blithely stated that no one would vault higher. Yet a few years later an unorthodox upstart named George Varoff took a longer run, used a higher grip, and sailed over the 14-foot, $6\frac{1}{2}$ -inch mark. With his new technique widely publicized, Varoff's mark lasted only a few weeks. At the 1949 Chicago Relays, 9 men vaulted 14 feet in less than 10 minutes, and last year more than 40 men scaled 15 feet, half a dozen topping 16. By the time you read this, someone may very well have soared over 17 feet.

Ask a first-class pole vaulter exactly how he operates, and he'll give you a detailed report on where his limbs are during each phase of the vault. But he may be wrong. Dr. R. V. Ganslen, UCLA kinesiologist and the world's foremost

[Continued on page 196]



Monorail switch is hinged section of track mounted on trundle that mates it with main track.

U.S.-designed monorail opened near Tokyo

A four-mile experimental monorail has been put into operation from Nikko, north of Tokyo, to Kirifuro Falls, a picnickers' goal, in an effort to solve Japan's need for mass transportation using minimum ground space.

The system, designed in the U.S., employs lightweight air-sprung cars riding on rubber-tired steel wheels on a track supported by prestressed concrete pillars. Horizontal wheels along the sides prevent sway.

Lockheed Aircraft helped organize the company with a half-dozen Japanese firms.



Tandem pairs of drive wheels support cars front and rear on trucks straddling rail.

Fish-research ship is floating laboratory

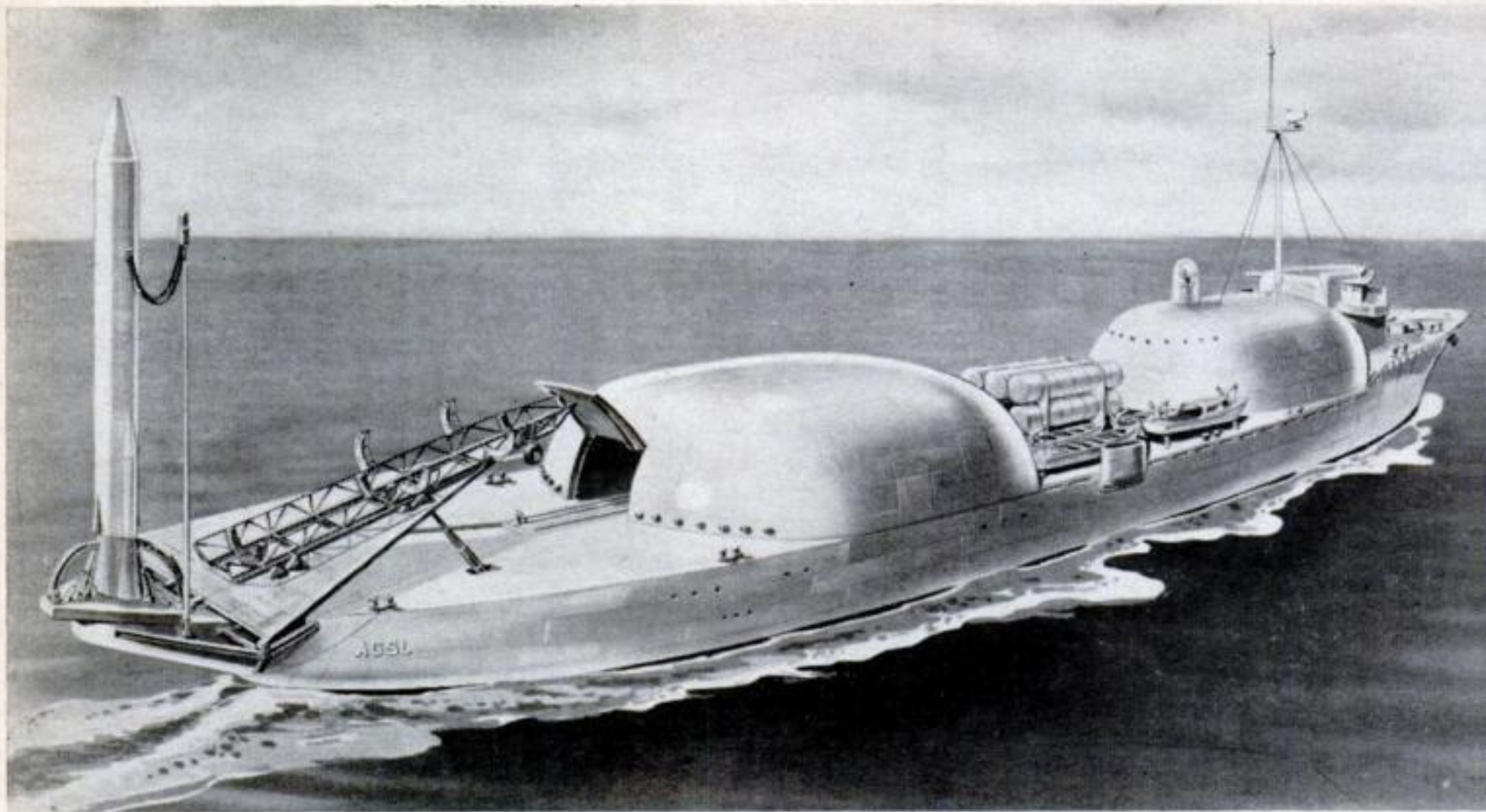
Latest ship to put out of the oceanographic institute at Woods Hole, Mass., is the Albatross IV at right. It's a marine biologist's dream.

Packed with electronic and other gear, it can stay at sea six or seven months at a time to study ocean life.

The ship cost the U.S. Bureau of Commercial Fisheries \$2,000,000 to build. Among new features: a powerful stern gantry that will lift 10,000 pounds of specimens from



the sea, TV cameras to scan operations, and fully equipped labs above and below deck.



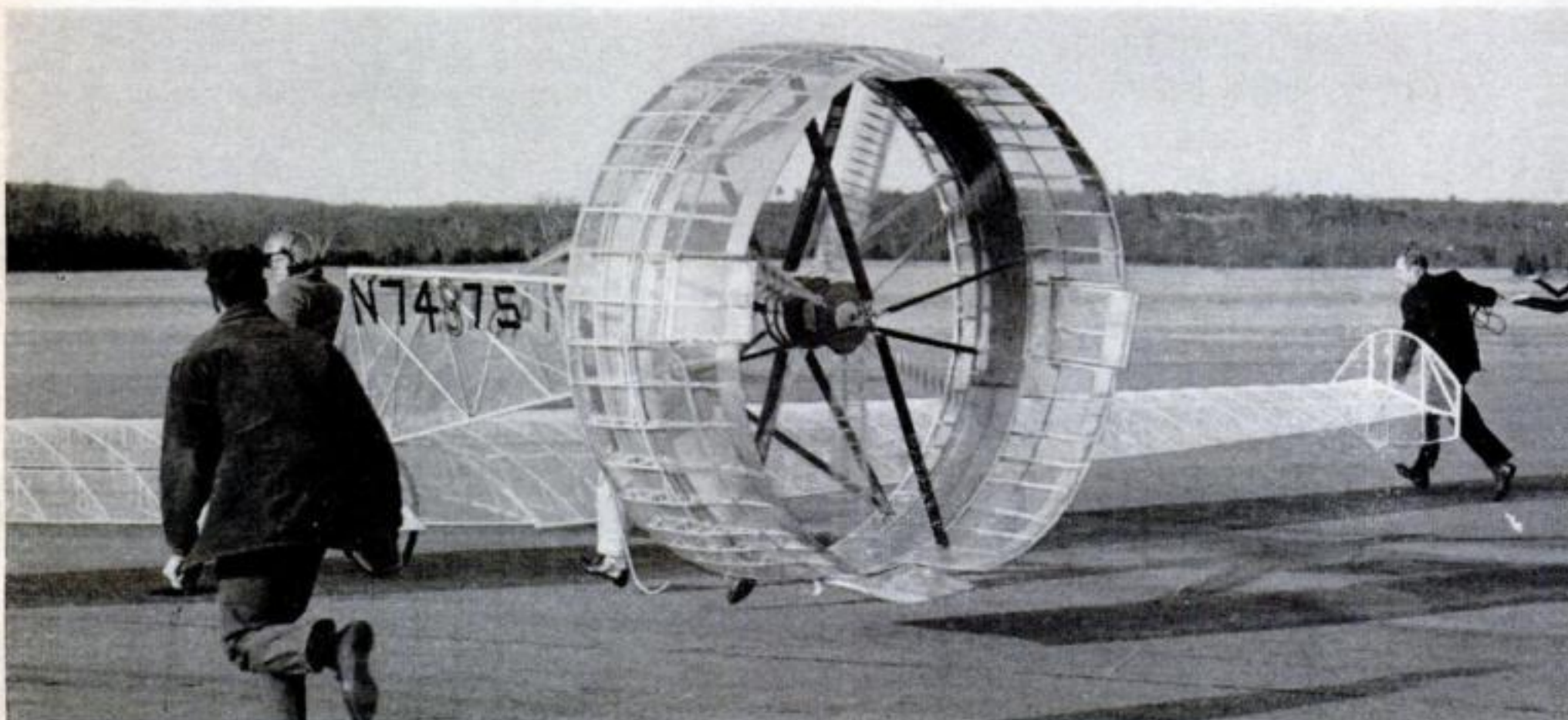
Navy Designs Seagoing Pad to Launch Satellites at Sea

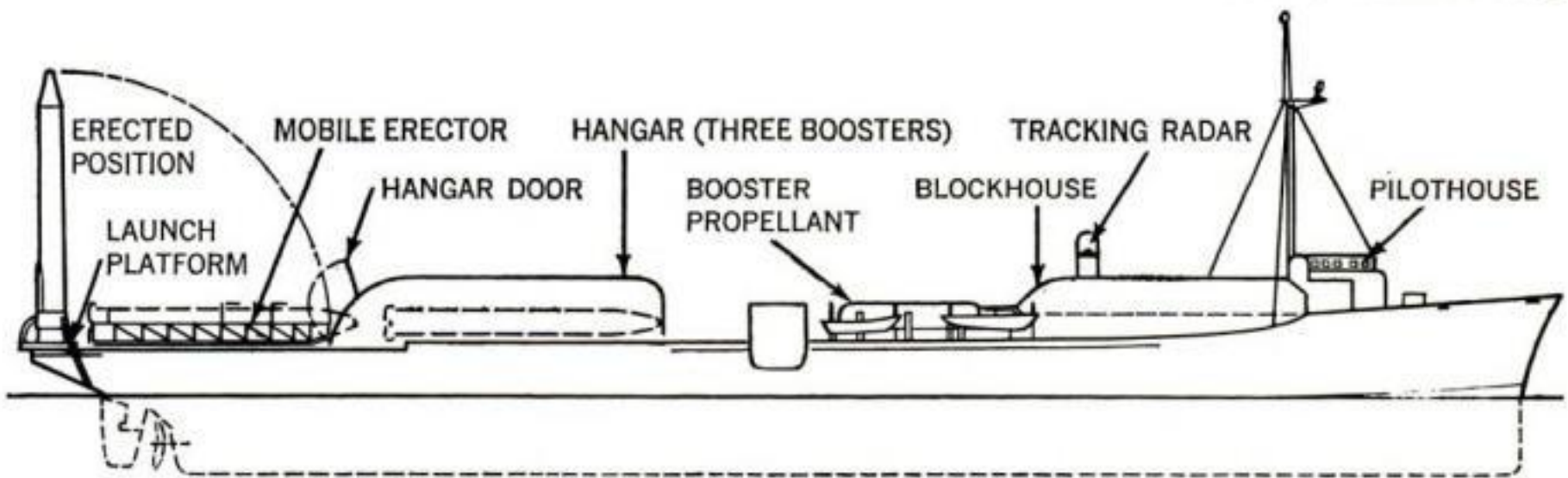
Resembling some futuristic battle wagon, the naval craft pictured here would actually have a peaceful mission. It's a proposed satellite-launching vessel, designed by the U. S. Navy's Bureau of Ships during a recent study of the feasibility of launching space vehicles at sea.

What the Navy envisions is a 17,700-ton

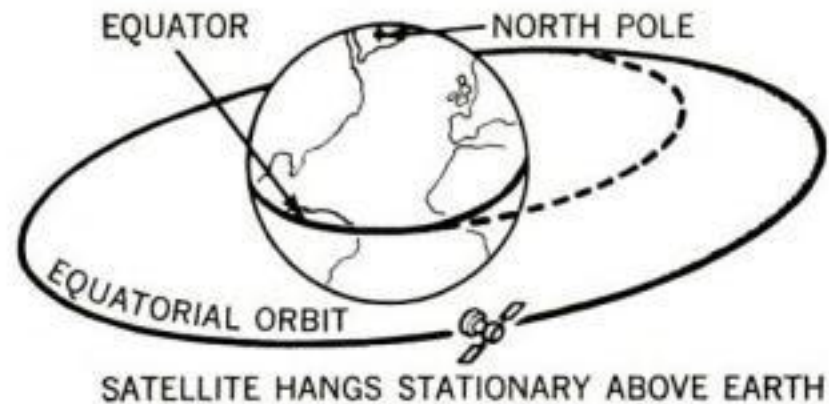
ship with an overall length of 565 feet and a 76-foot beam. It would cruise 10,000 miles at 20 knots.

Bulging above deck, a hangar aft houses up to three satellite-launching rockets. One at a time, they are erected and fired from a launcher hanging out over the stern. Another bulge, forward, serves as a block-





Proposed satellite-launching vessel (left) would have rocket hangar and launcher aft, block-house forward, shown in profile above. From position on equator, the ship could put a weather or communications satellite into the desirable equatorial orbit shown at right, which would enable a satellite of suitable velocity to hang motionless above the earth.



house during the countdown. Stabilizing tanks, and an oversize rudder linked to an autopilot, steady the ship enough for launchings while under way at 15 knots, in a sea with waves up to five feet.

Such a craft would have important advantages over present U.S. launching sites in Florida and California. Roaming the globe, it could put up a satellite from anywhere. In particular, it could launch one from the equator—the simplest way to place a satellite in a desirable "equatorial orbit" so as to hover over one spot on earth, as coming U.S. weather and com-

munications satellites are intended to do.

Launched from Cape Canaveral in Florida, say, a satellite could not remain truly stationary—but would swing back and forth across the equator in a figure-8 pattern [see "The Stay-Putnik," March, '63], unless its course were altered to an equatorial orbit after launching. That would take a powered, remote-controlled maneuver, difficult by present technology. One alternative would be to build a whole new U.S. launching complex, on land, somewhere along the equator. A satellite-launching ship, its proponents believe, offers a simpler answer.

Pedal-power plane wins master's degree for builder

The flying bicycle at left was conceived and built by James M. McAvoy, a 26-year-old student at Georgia Tech. The project was approved as his thesis for a master's degree in aerospace engineering.

The MPA-1—for muscle-powered aircraft—has a wingspan of 54 feet stretching out from a 16-foot fuselage, with a mylar skin covering an aluminum-and-balsa frame. Pedals transmit power through a gearbox and torque tubes turning counter-rotating propellers at 240 r.p.m.

McAvoy had the help of plans for a British man-power plane built last year and an Italian one that flew in 1937. Although his plane didn't get off the ground on first try, it's designed to take off at 17 m.p.h., reach 10-foot altitude at 20 m.p.h.

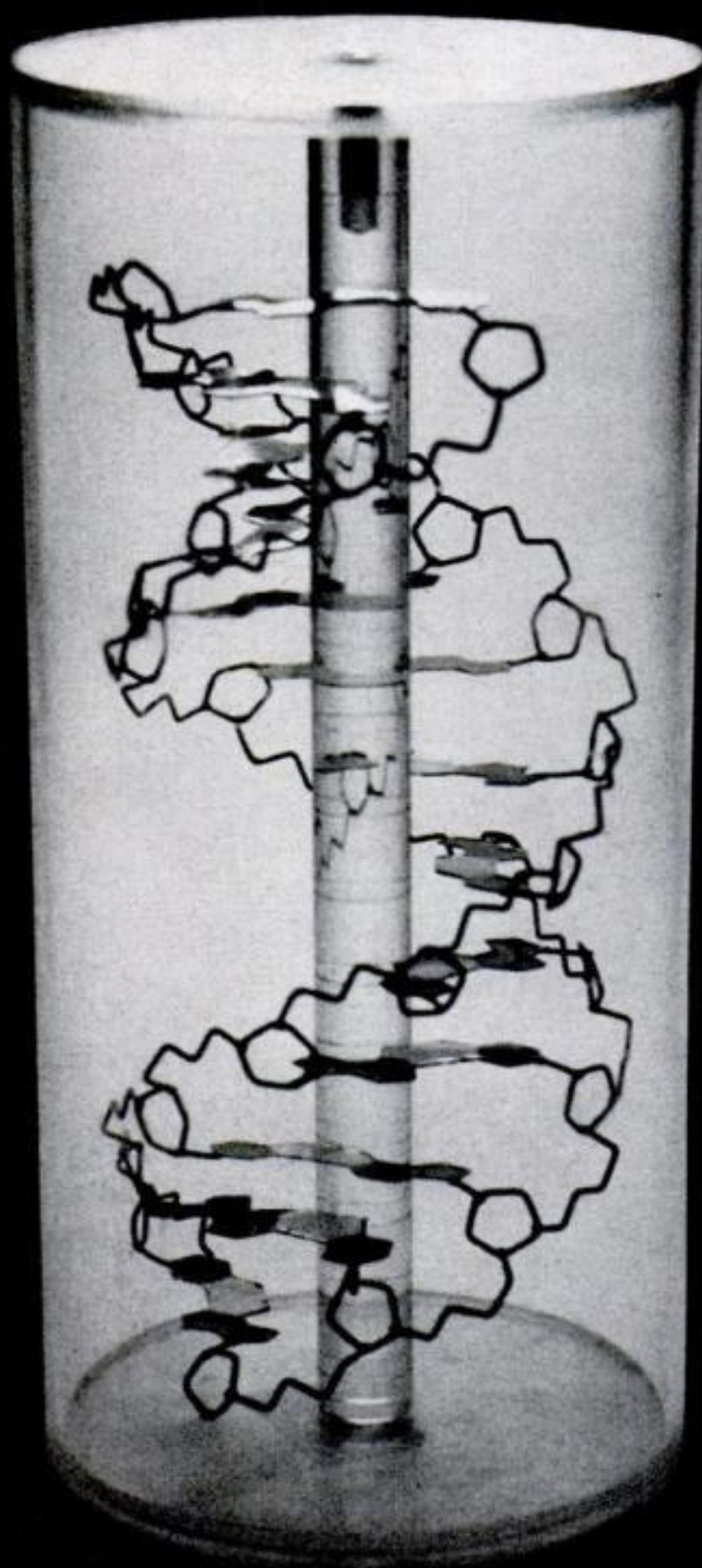
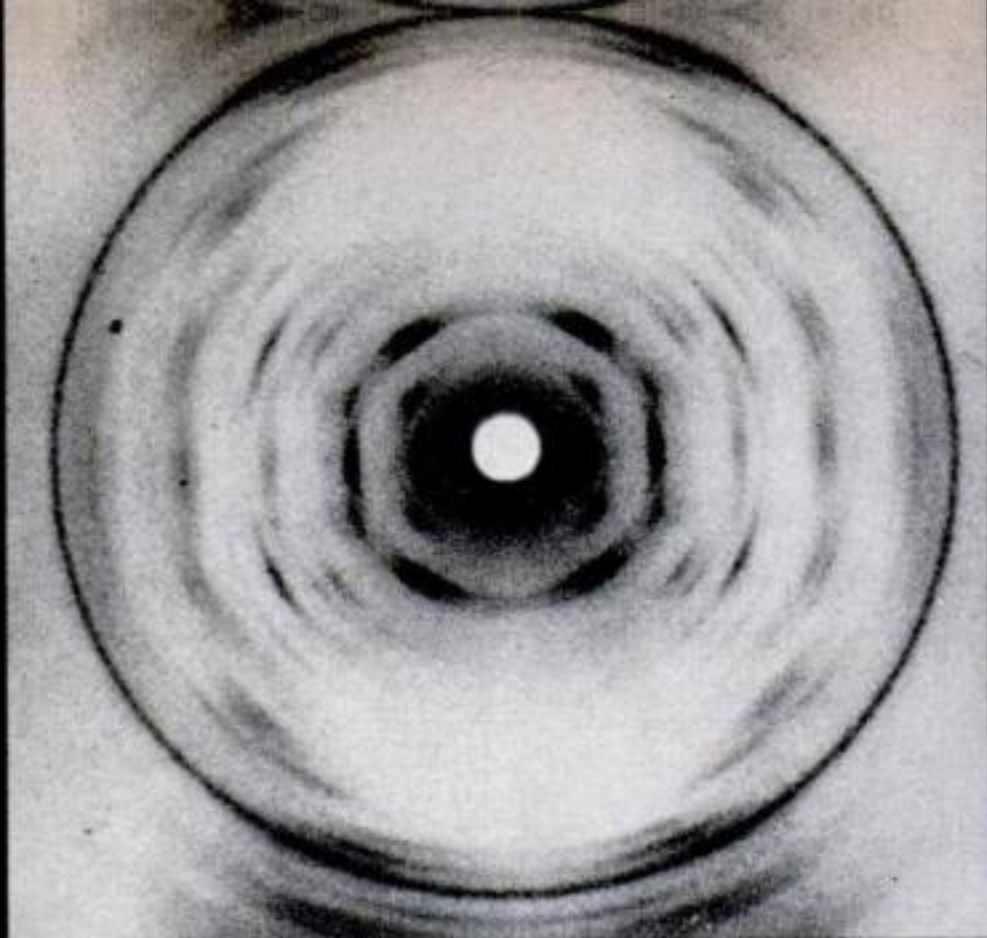


Drive is like a bicycle's with stick to operate controls. Pilot Robert W. Ritchie trained on a dynamometer.

DNA

It Calls
the Signals
for Life

Like a spiral staircase, shape of DNA molecule is shown by model at right, worked out mathematically from X-ray diffraction photos, like one at top by L. D. Hamilton of Sloan-Kettering Institute.



How three men got the Nobel Prize for solving a jigsaw puzzle: assembling the pieces of a molecule that made you what you are—and keeps you ticking

By Wallace Cloud

LAST December an American biologist and two English physicists received formal recognition, in the shape of a Nobel Prize, for a discovery made 10 years ago—a discovery that started a chain reaction in biology.

They determined the structure of a molecule that provides answers to questions scientists have been asking for over a century:

- How does a heart muscle “know” how to beat?
- How does a brain cell “know” how to play its role in thinking and feeling?
- How do the cells of the body “know” how to grow, to reproduce, to heal wounds, to fight off disease?
- How do infectious bacteria “know” what diseases to cause?
- How do single fertilized egg cells, from which most of nature’s creatures begin, “know” how to become plants, animals, people?
- If one such cell is to multiply and form a human being, how does it “know” how to produce a potential Einstein or a Marilyn Monroe?

The stuff that genes are made of. Sounds like a lot to expect of a molecule—even one with a jaw-breaking name like deoxyribonucleic acid (known more familiarly as DNA). But it’s scientific fact that DNA is what genes are made of. DNA molecules supply the basic instructions that direct the life processes of all living things (except a few viruses). The DNA molecule contains information in a chemical code—the code of life.

The effects of discovery of the structure of DNA have been called “a revolution far greater in its potential significance than the atomic or hydrogen bomb.” Professor Arne Tiselius, President of the Nobel Foundation, has said that it “will lead to methods of tampering with life, of creating new diseases, of controlling minds, of influencing heredity—even, perhaps, in certain desired directions.”

I asked the American member of the Nobel Prize trio, Dr. James D. Watson, about these speculations in his laboratory at Harvard. It was a few weeks before he flew to Stockholm to receive the award

Three Nobelmen



Dr. James D. Watson, now at Harvard, worked on DNA in 1953 while in England.



Dr. Francis H. C. Crick of Cambridge was Watson’s partner in the research.



Dr. Maurice H. F. Wilkins, King’s College, London, made essential X-ray photos.

CONTINUED

along with Dr. Francis H. C. Crick of Cambridge University and Dr. Maurice H. F. Wilkins of King's College, London.

The boyish 34-year-old Nobelman, who did the prize-winning research in England when he was only 25 (he entered college at 15, had been a Quiz Kid before that, in the days of radio), refused to endorse the wilder predictions about the future of DNA research. He said, "The average scientist busy with research looks ahead anywhere from an hour to two years, not more."

Conceding that discovery of the structure of DNA was as important as the working out of atomic structure that led to the atom bomb, he added, "It will have a very profound effect, slowly, on medicine. Doctors will stop doing silly things. Our knowledge of DNA won't cure disease, but it gives you a new approach—tells you how to look at a disease."

Dr. Watson went on to explain just what he and his co-workers discovered during those days of inspired brainwork in England, back in 1953, and how they did it.

The discovery was not the work of an institute-full of technicians, he said, but the product of four minds: He and Crick did the theoretical work, interpreting cryptic X-ray diffraction photos made by Wilkins, who had as collaborator an English woman scientist, Dr. Rosalind Franklin. She died in 1958. She "should have shared" the Nobel Prize, said Dr. Watson.

Picking up the thread. DNA was not a newly discovered substance. It had been isolated in 1869, and by 1944 geneticists were sure it was the substance of the genes—the sites of hereditary information in the chromosomes. Then they started asking, "How does it work?" That's the question Watson and his co-Nobelists answered.

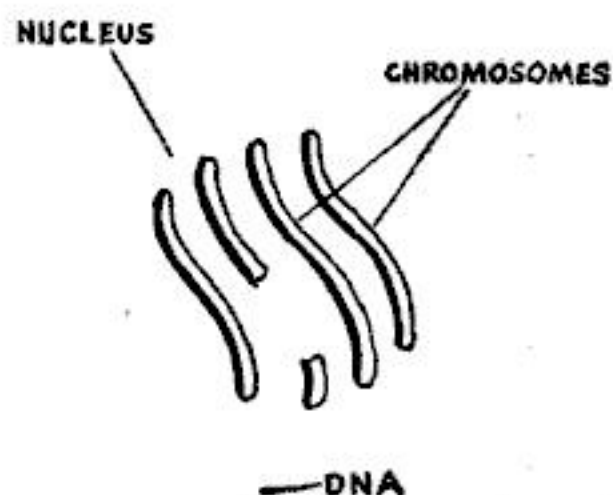
They knew DNA as one of the most complex of the "giant molecules" known to man. It was believed to have a long, chainlike structure consisting of repeating groups of atoms, with side groups sticking out at regular intervals.

The shape of the DNA molecule was important. In the cell, many of the larger molecules work together like machine parts, and their mechanical properties are as important as their chemical activity. However, even the electron microscope, through which it is possible to see some of the biggest giant molecules, shows DNA only as a thread, without detail.

One way of "looking" at molecules is to take them apart by chemical treatments that make

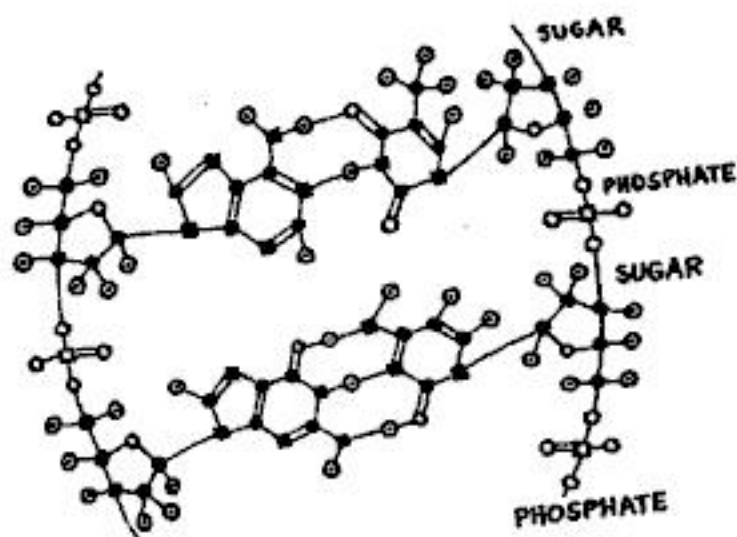
[Continued on page 186]

How DNA molecules



A miniature chemical factory, the living cell (diagramed above) is controlled by "executive molecules" of DNA—deoxyribonucleic acid. In all plant and animal cells, DNA is located in chromosomes, threadlike bodies in the nucleus. Bacteria have simpler structures, but are also directed by DNA.

Control depends on the ability of DNA molecules to store and transmit information. Long, twisted strands of DNA are archives of instructions for



● CARBON
■ NITROGEN
○ OXYGEN
□ PHOSPHORUS
⊙ HYDROGEN

all processes of the cell.

Information is recorded in a molecular code made possible by the structure of the DNA molecule, detailed above.

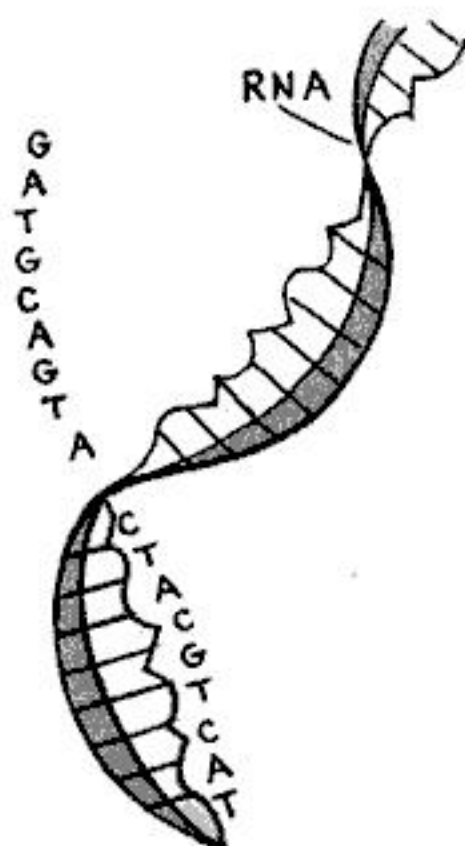
Twin backbones are repeating chains of submolecular units, called deoxyribose sug-

supply instructions to direct life processes of living things

ars, linked together by phosphate bonds. Bridging across are pairs of subunits named adenine, thymine, cytosine, and guanine—usually called A, T, C, and G.

These units serve as a four-letter alphabet. As shown below, their sequence spells "words" that are meaningful to the cell.

Instructions are read by means of another kind of molecule, RNA (ribonucleic acid), a single twisted chain with side groups that correspond to the subunits of DNA. RNA mole-



cules are built by the chemical machinery of the cell, using one strand of a DNA molecule as a template. Then the RNA molecule peels off, acts as a messenger to deliver instructions elsewhere in the cell.

Two-stranded structure of DNA makes possible use of the same information-transfer mechanism for copying DNA molecules, so that hereditary instructions can be passed from generation to generation.

Pairing of subunits follows a rule: A can pair only with T, C pairs only with G. (Note that

this rule is followed throughout illustration.) Thus, the strands are not identical, but are complementary, and each can serve as a template for the reconstruction of the other.

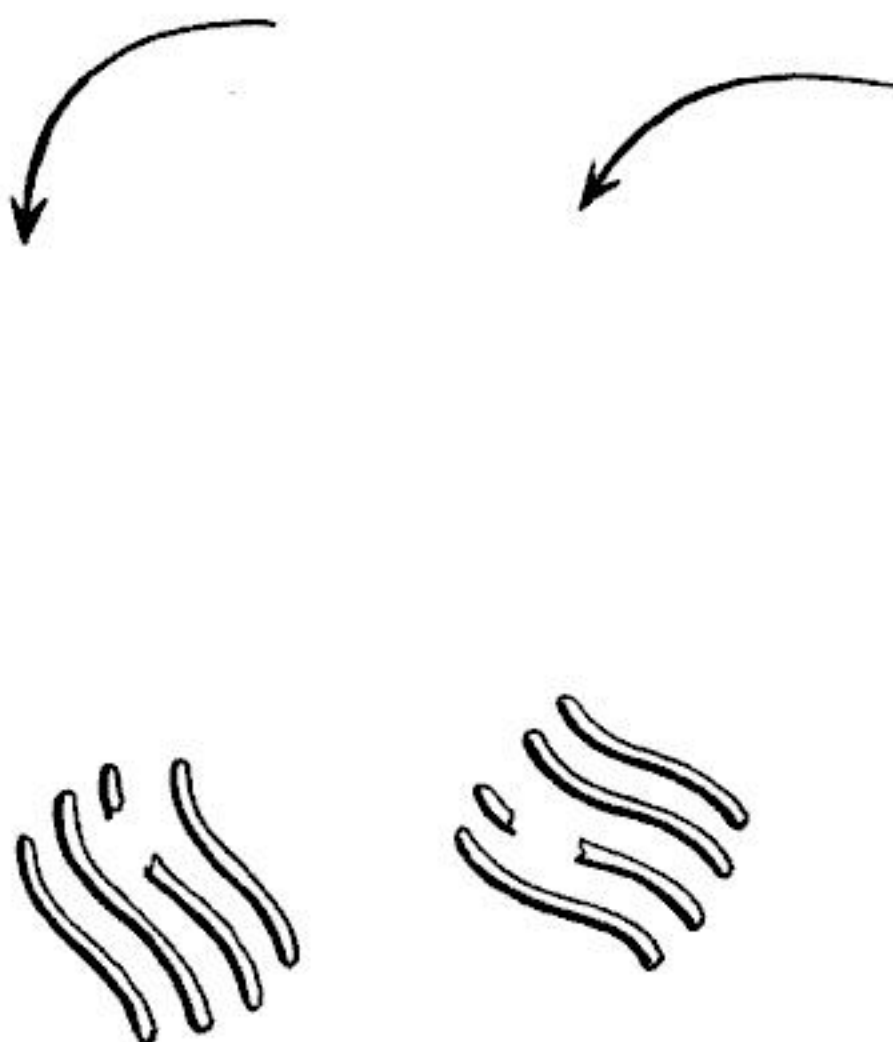
When a DNA molecule is to be copied, the molecule "un-zips," as shown symbolically above. Then the machinery of the cell uses the same zipper-like action to reconstruct each missing half, as shown below, from subunits freely available in the nucleus of the cell. Now there are two DNA molecules identical with the original one.

Every DNA molecule in the chromosomes of a cell is cop-

ied prior to cell division, the basis of all reproduction. When the cell divides, the chromosomes split in half and a full complement of half-chromosomes goes into each new cell.

Since all the information-bearing DNA molecules have doubled, each cell now contains exactly the same stored instructions as the original parent cell, and can carry out the same life processes.

That's how you got those big brown eyes. (The family secret for manufacturing the pigment in your eyes was handed down by means of your ancestral DNA.)

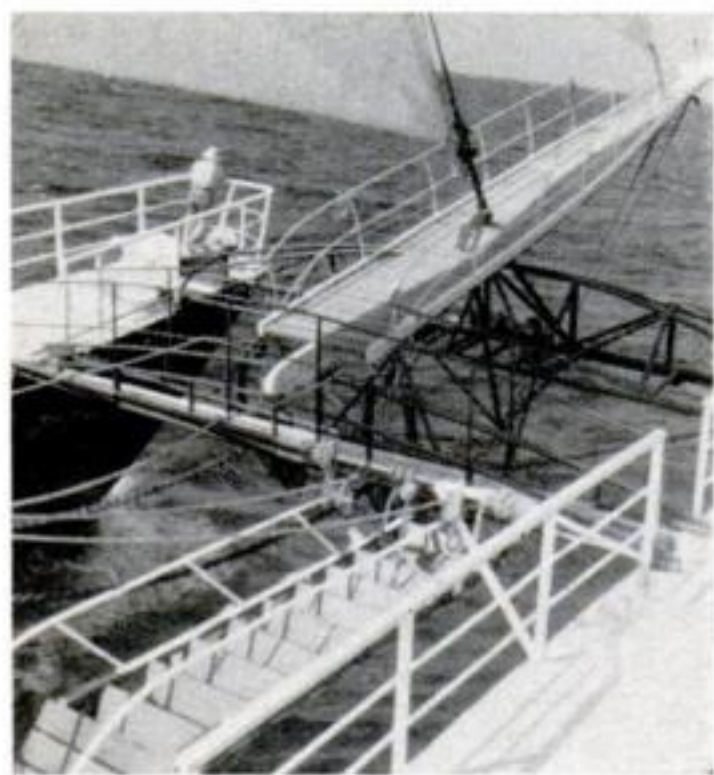
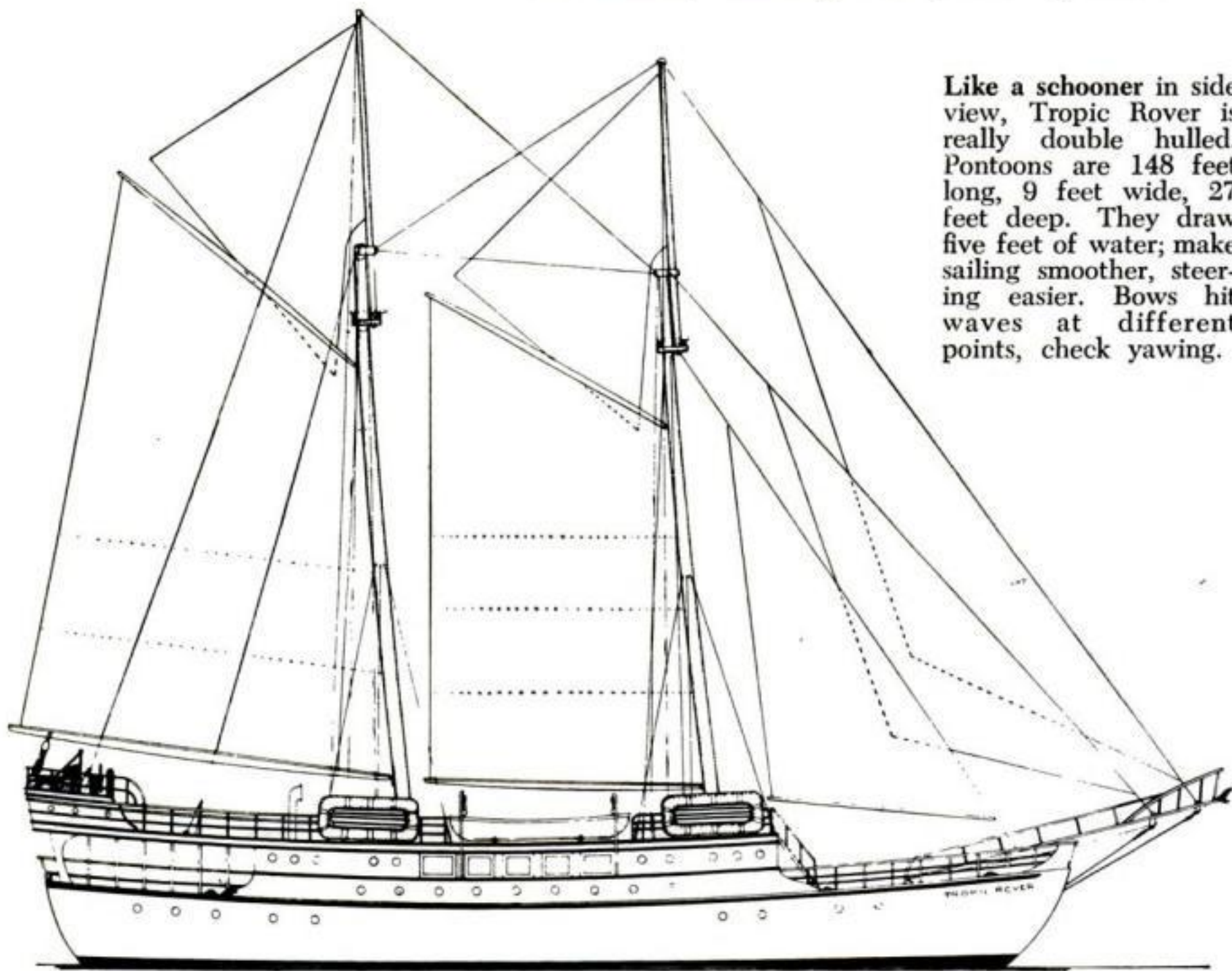


Big cat island-hops in Bahamas

The \$400,000 Tropic Rover, world's largest catamaran, is now a familiar sight in the waters off the Bahamas. Built at Fort Lauderdale's Summerfield Boat Yard, the 150-ton fiber-glassed-plywood cat measures 175 feet from bowsprit to stern. Fully loaded, she draws only five feet of water, making it easy to slither in and out of shallow coves.

Capt. Sid Hartshorn, designer and skipper, makes Nassau her home port. The Rover takes on as many as 66 passengers for informal 10-day cruises through the islands, following the prevailing winds and

Like a schooner in side view, Tropic Rover is really double hulled. Pontoons are 148 feet long, 9 feet wide, 27 feet deep. They draw five feet of water; make sailing smoother, steering easier. Bows hit waves at different points, check yawing.



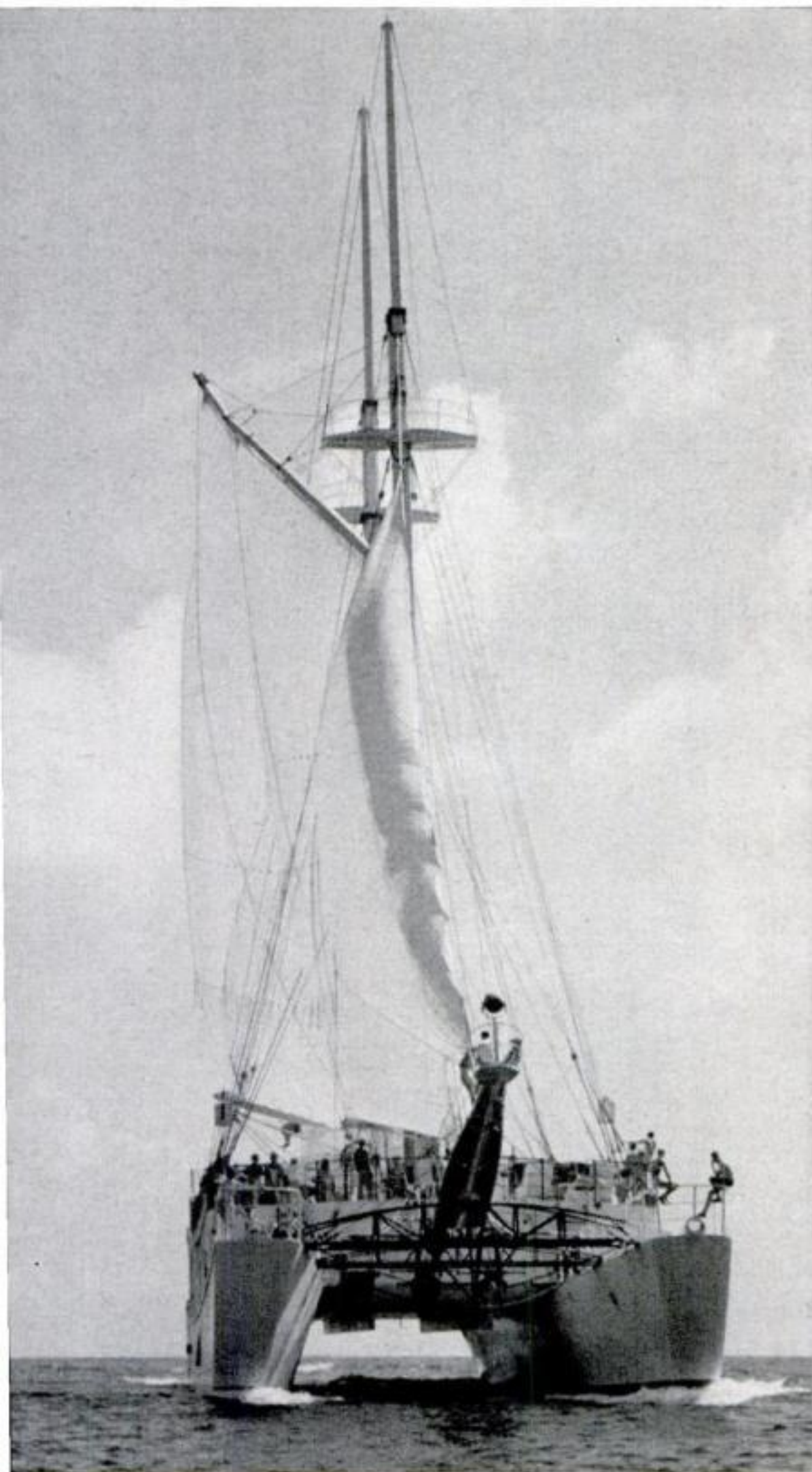
Fishermen use bowsprit catwalk (left); swimmers, shore parties use ladder (foreground) to enter water or dinghies.



British flag flies from Nassau-based catamaran.

stopping at Governor's Harbour on Eleuthera Island, at Harbour Island, and several other places. Besides 10,000 square feet of sail billowing from masts 131 and 135 feet tall, the Tropic Rover has two 270-hp. auxiliary diesels. Either wind power or engine can push her up to 12 knots.

Passengers occupy staterooms in the twin 148-foot hulls, aft under the quarterdeck, and in fo'c'sle dormitories. Cocktail lounge and dining room are on the main deck, an underwater-viewing room in one of the hulls, and swimming between the two.



Rover's yardarms can carry 10,000 square feet of sail.



Scoots to pick up street litter

If this keeps up, the street-cleaning man's pushcart will soon give way to a motorized version. New York City's Department of Sanitation is trying out a three-wheeled litter-collecting vehicle as a possible replacement. If all goes well, the new Litter Scooter will help speed up the work of keeping city streets, parks, and playgrounds clean.



Glass plumbing

No big pipe wrench needed here. You mate the joints of this see-through pipe with a small torque wrench. Detroit plumbing contractors are pioneering the tempered-glass piping in industry, with a view to its eventual use in homes. Think how easy it'll be to spot that diamond ring that slips off in the basin and slithers down the drain.



Here's how new materials, ready-made for the inventor, can start those royalty dollars flowing in

Now—Inventing Is Easier Than Ever!

By Norman Carlisle

WHAT'S happening to the independent inventor? Is he a dying breed, losing out in the face of competition from team research in the big industrial labs?

Not at all. The Patent, Trademark and Copyright Research Foundation, setting out to look into the whole business of who's doing the inventing in America today, found that, in the past decade, 40 percent of all patents went to independents—men working alone. The Yankee ingenuity that has always made Americans the inventingest people on earth is breaking out all over the place.

"The ranks of basement inventors run a wider gamut than ever," was the way John Tigrett, perhaps America's leading invention broker, put it to me. Among the 16,000 idea-getters Tigrett deals with each year, he lists lawyers, teachers, truck drivers, housewives, journalists, engineers, airline pilots, and business executives—a full occupational and educational spectrum.

Moreover, the inventions developed by individual inventors, most of whom have never seen the inside of a research lab, cover an impressive range, from tricky gadgets to processes that are changing whole industries. Some have earned a few thousand dollars, some are

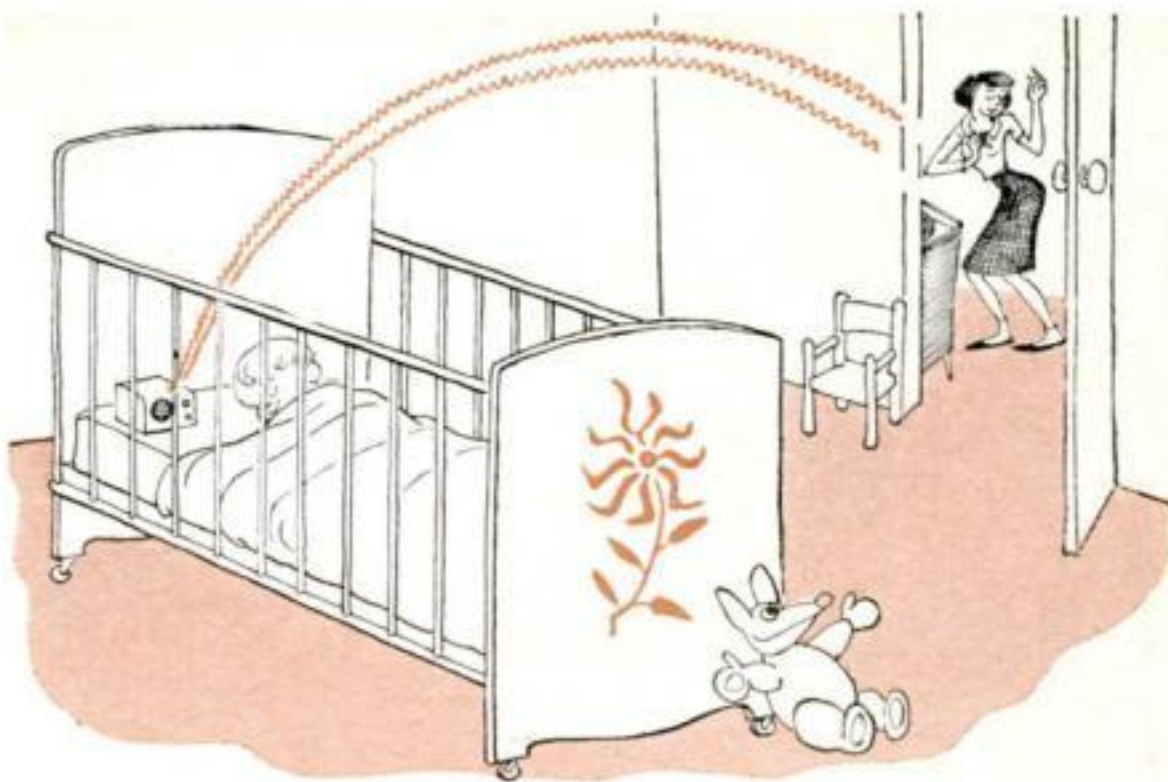
Silencing baby (without violence) is easy with box that produces steady B-flat hum. Transistors made invention possible.

bringing in royalties that run into millions.

Inventing is not easy—there are problems that lie between the bright idea and the checks in the morning mail, among them the fact that it takes about three years to get a patent. But in many ways inventing is easier than it used to be. Whether you're a weekend home-workshop tinkerer, or a trained technical man who chooses to go it alone, you've got factors working for you.

Some areas, of course, are the almost exclusive province of big-lab research. You're probably not going to develop another nylon, discover a new plastic, or make a portable reactor in your basement. But the very fact that team research is turning out so many new products—plastics, metal alloys, wonder chemicals, transistors, miniaturized batteries, and a host of other materials and devices—gives you new inventive opportunities.

I got dramatic evidence of how they're being used by today's independents when I investigated the experiences of



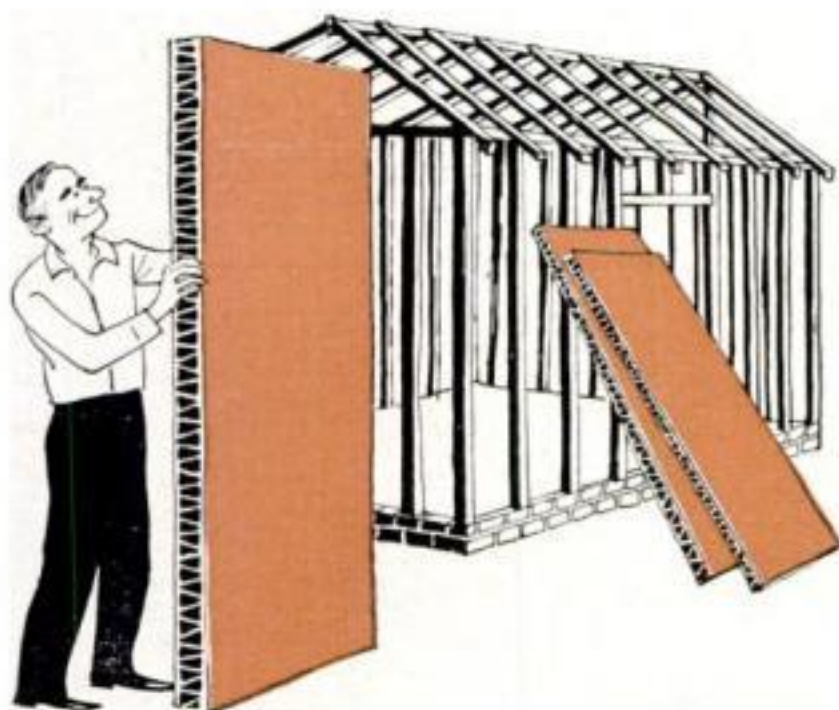
more than 100 currently active, successful inventors.

Building a paper house. Take Harold Humes and his paper house. Humes, a writer with a technical turn of mind, didn't have to invent the makings for his new kind of dwelling. That was done for him by chemists for the big concerns that turn out treatments for making paper water-, fire-, vermin-, and just about anything-proof. When Humes got the idea that such paper would make a fine summer cottage, or low-cost house for underdeveloped areas, all he had to do was design corrugated, honeycombed panels and work out a method of fastening them together with metal straps.

It took a lot of doing, of course, before Humes solved all the problems of making paper pillars, floor, and roof—but he had all the ingredients and the help of the companies that manufacture them. The result is 27 different patents, or patents applied for.

A Texan named Edwin Foster has struck it rich by finding new uses for the marvelous alloys of the steel metallurgists. Among his 50 recent patents are many for special steel springs, which Foster has found a way to coil. They are employed in such items as long steel tape rules (Foster's springs are used in all that run over 12 feet) and the hose-retracting mechanism used on new gasoline pumps in service stations.

When an aluminum window got stuck, Foster figured that "there must be a bet-



Huffing and puffing weren't required to test inventor Harold Humes' paper house. The work on the materials had already been done for him.



Everybody's in the act these days. Truck drivers, business executives, housewives, pilots—they're all busy inventing new gadgets.

ter way to get this thing up." There was. Foster did it with a ribbon of stainless steel, a device now widely used.

When Foster saw how easy it was for electric irons to get pushed off ironing boards or to be forgotten on them, he dreamed up another spring device. It lifts an iron off the board as soon as the user lets go. This invention, sold to a big appliance maker and now in production, took years of work on Foster's part. But his job of making a spring that could lift when required to do so, but not resist the ironer, was made easier by the availability of the special type of steel he used.

Sculpture in a kit. A new plastic resin brought New Yorker Charles Powell's invention to reality. Powell had hit on an idea for making anyone a sculptor. There was nothing new about a figure assembled by joining premolded plastic

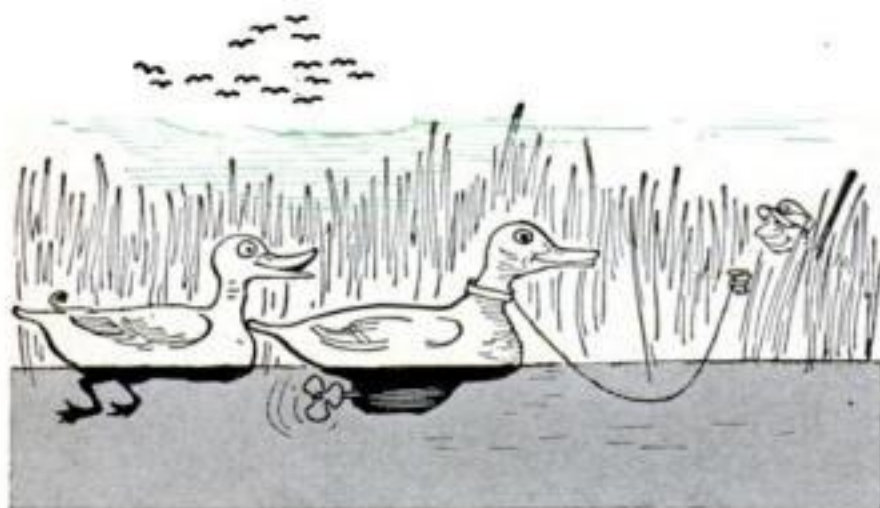
components together. They had long been on the market. The trouble was that when you got them together they looked like what they were. Powell had a better idea: Let the person assemble the parts and then cover them with a material that would hide the joints. What kind of material? Powell didn't know, but he thought that the answer was to imbed small particles of wood, metal, or stone in some kind of paintlike plastic that would set after application. He found a chemical company that made a vinyl resin that could serve as the binder he wanted. A $\frac{1}{16}$ - to $\frac{1}{18}$ -inch coating, applied with a brush, made a piece of sculpture look like the real thing. The sculpture was weighted by sand poured through an opening, which was covered by the coating.

Simple? Yes, but it was a patentable invention which, while it may not make Powell rich, will certainly give him a handsome return on his time.

In recent years a number of research labs have come up with new cements and glues—marvels of stickiness that will fasten almost anything to almost anything. They've been a boon to home craftsmen, industry, and amateur inventors.

James Severino of Encino, Calif., decided that the method of installing electrical conduits, receptacles, and outlets with nails, screws, or clamps was pretty

[\[Continued on page 193\]](#)



Invention for the birds: These mobile duck decoys with motors and propeller shafts use tiny batteries and motors on the market.



Pigmy among giants is this '63 Indy contender, designed and built by Mickey Thompson. It has 12-inch wheels, is 33 inches high and 11 feet long. The 1,050-pound speedster develops over 350 hp. from a modified Corvette engine.

Brand-name engines will compete this year to give Indianapolis Speedway crowds the thrills Dad got

By Henry B. Comstock

COME Memorial Day, a quarter of a million railbirds will gather in the stands and in the infield of the Indianapolis Motor Speedway. They will litter the place with empty coke bottles, bales of paper, and remnants of hot dogs—and, as usual, it will take all June to sweep up after them.

They will be there to watch the most famous of all U.S. automobile races on the most famous of all U.S. race tracks, the "Indianapolis 500." They also will be there for an answer to a question.

Can an invading group of nonconformist race cars, most of them powered by engines originally designed in Detroit's passenger-car factories, sweep the classic racing engines off the track—as brooms

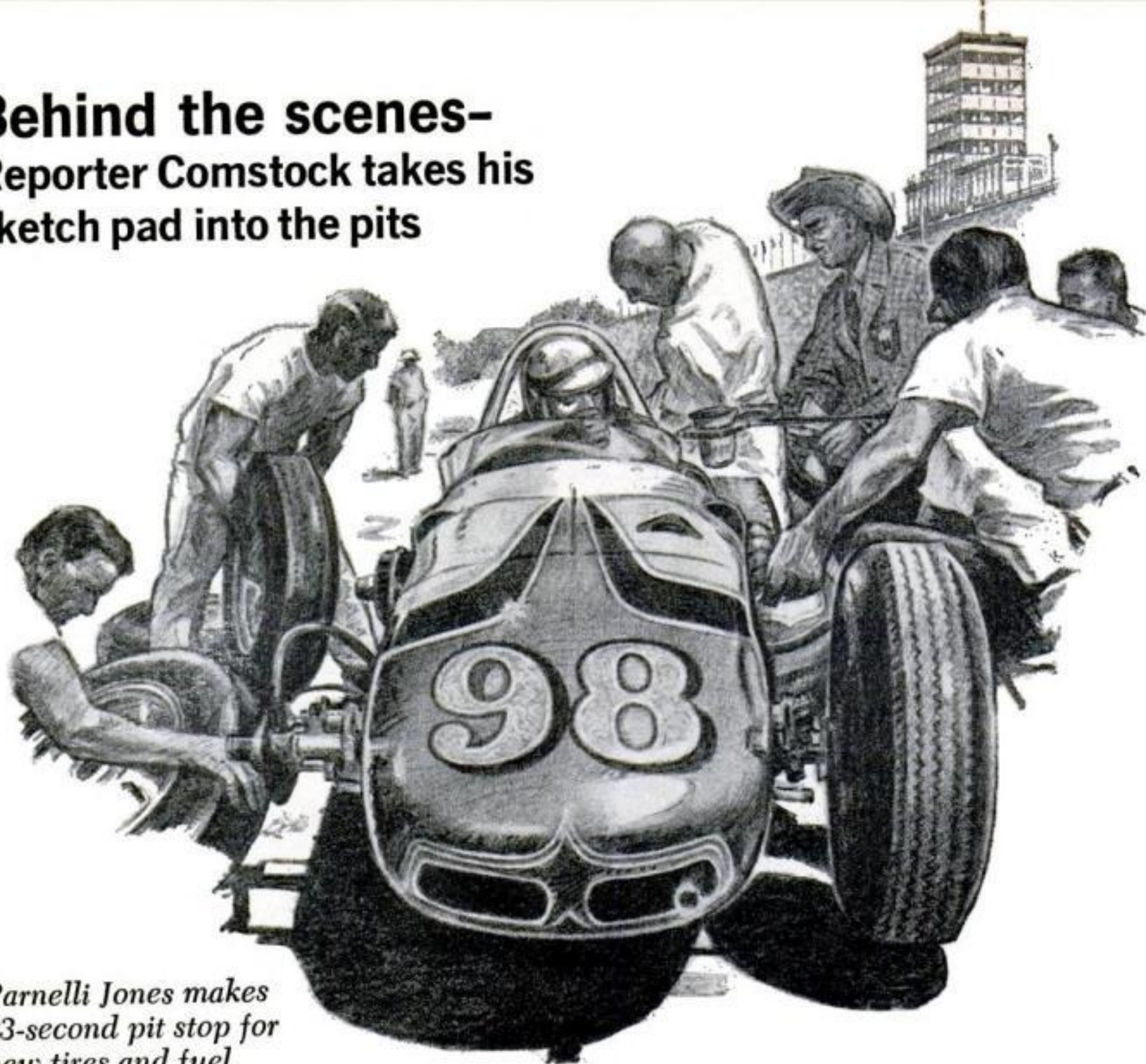
will clear away the spectators' debris?

For a quarter of a century, practically all "500" cars have been propelled for their 3½ hours on the oval by four-cylinder, specially tooled engines that have come to be known as Offenhausers, or "Offies."

These engines are almost mirror images of an engine that first won the "500" in 1934. That engine began as an eight-cylinder job in 1922 on the sketch pad of a man named Harry Miller, became a four-cylinder engine a few years later under a designer named Fred Offenhauser, and today is manufactured by a brace of Californians, Lou Meyer (himself a three-time winner of the "500") and Dale Drake.

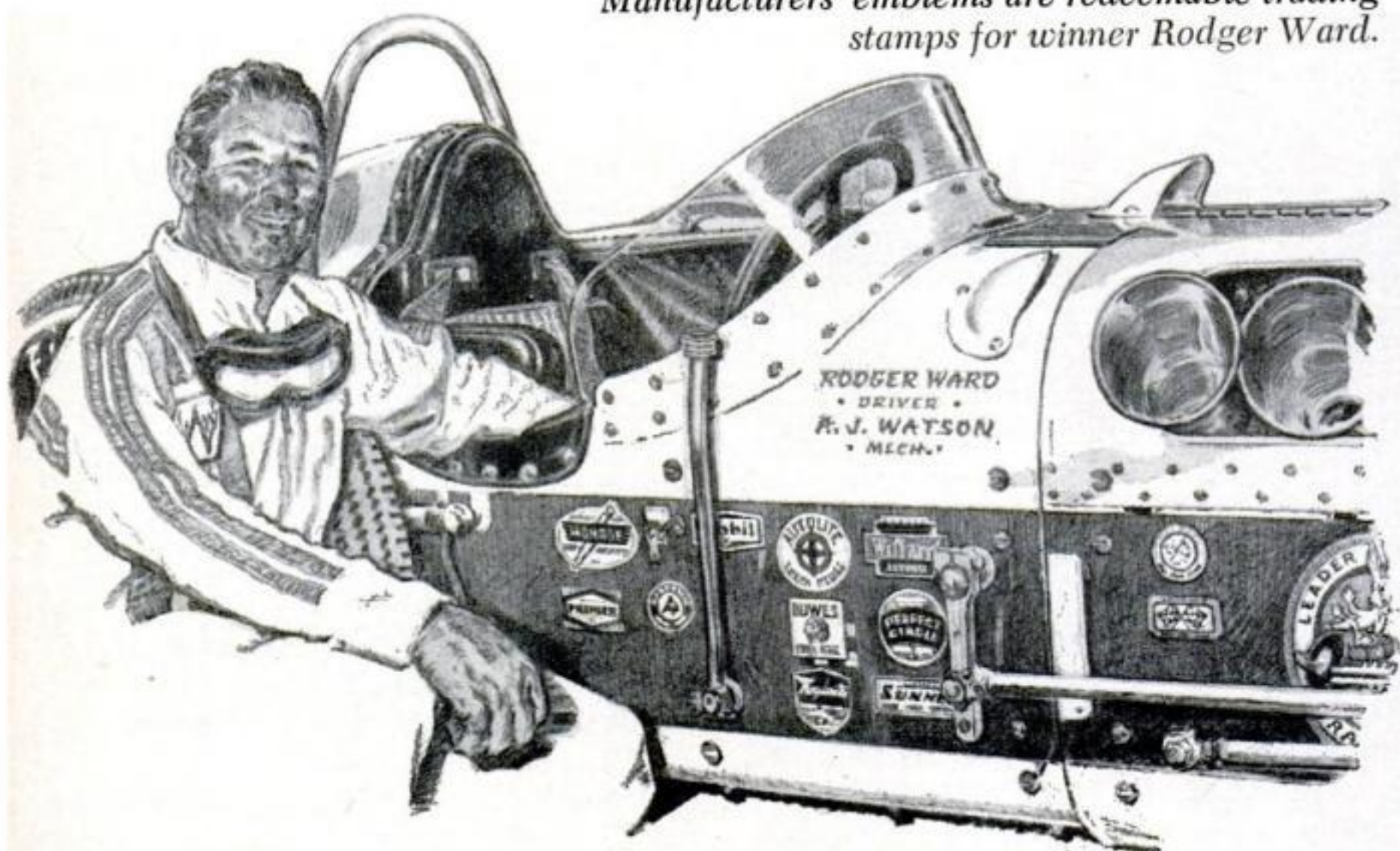
Occasionally, in the annual melee of the 33 starters, there has been a maver-

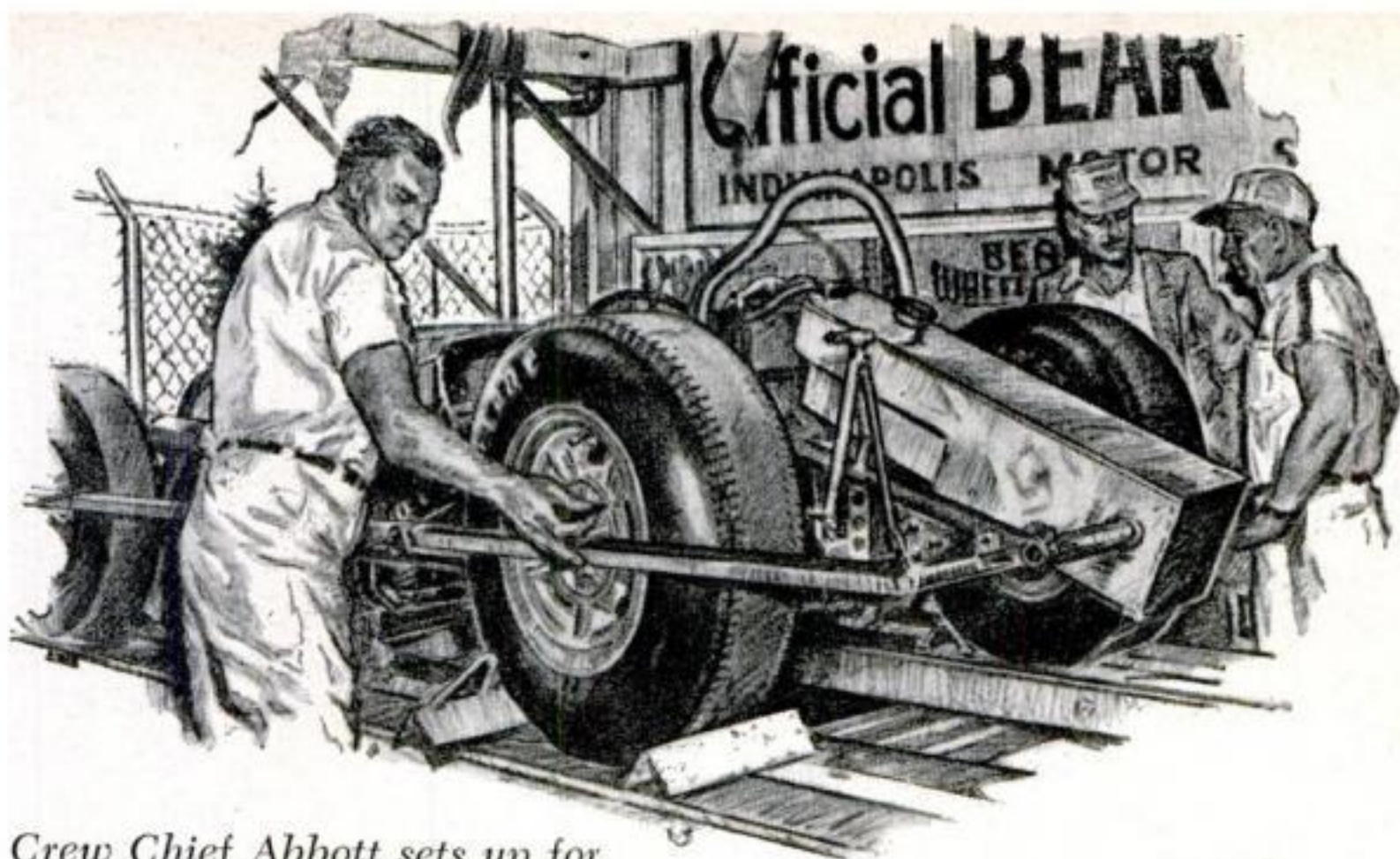
Behind the scenes— Reporter Comstock takes his sketch pad into the pits



*Parnelli Jones makes
23-second pit stop for
new tires and fuel.*

*Manufacturers' emblems are redeemable trading
stamps for winner Rodger Ward.*

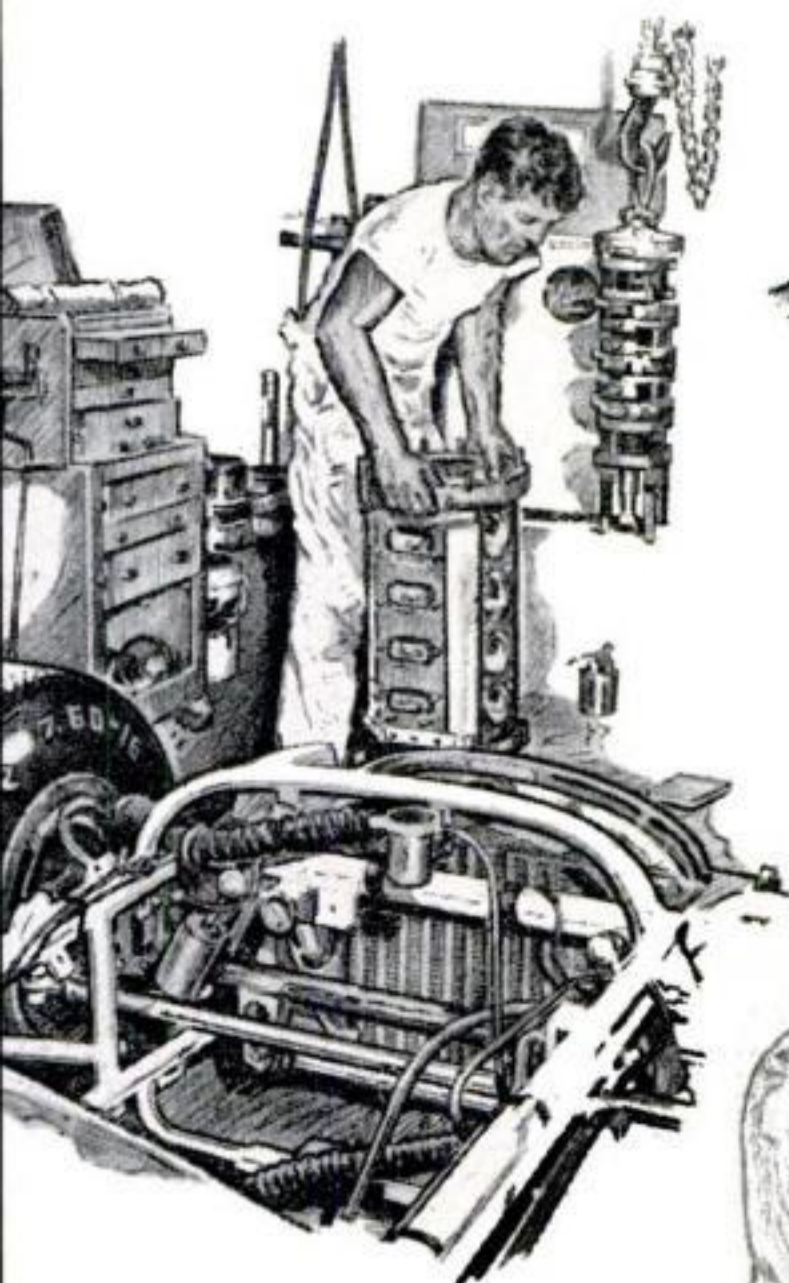




Crew Chief Abbott sets up for Bear alignment check.

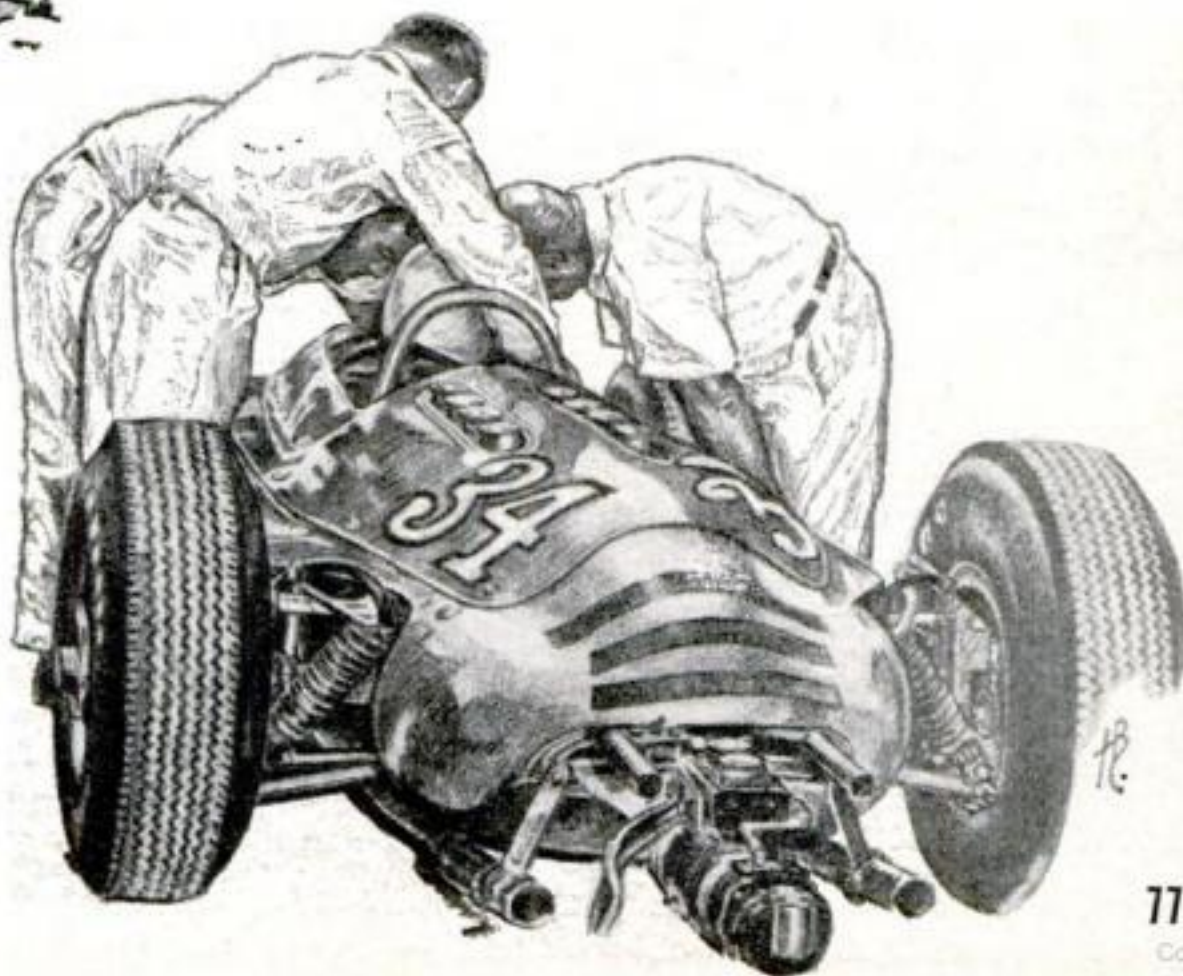


Mickey Thompson finds cockpit of lightweight he built as snug as a spaceman's capsule.



Bud Moyer hefts banger block of A. J. Foyt's One-Spot.

Crewmen strap Dan Gurney in, as portable starter stands ready to stem-wind engine.



CONTINUED

ick. There were V-8s, unrelated to anything that Detroit produced. There were even diesels.

But mostly, since 1937—when the last of the Detroit-designed engines (those of Studebaker, Ford, Hupmobile and Hudson were the most prominent) stopped competing—they have been Offenhausers.

Now, for the 1963 event, modified Detroit engines are once again back in the running in an effort to give the Offies their lumps. Here's a roster of them:

- Five Harvey Aluminum Specials, designed and built by Mickey Thompson of Long Beach, Calif. These are rear-engine jobs, propelled by aluminum versions of the Corvette 327-inch V-8. With their cubage reduced to 256 to meet Indy maximums, horsepower will be around 350.

Two of the five cars are the same ones that competed in 1962. They have their same 15-inch wheels. Three will have tiny 12-inch wheels that make them look like Soap Box racers.

Maximum engine revs have been greatly increased by using forged-aluminum, rather than cast-steel, rocker arms. Stronger—and easier on shafts, springs, and oil temperatures—these parts are also 50 percent lighter. Two of the roadsters are modifications of cars Thompson entered in last year's race. At that time they were powered by Buick engines. One qualified and, with versatile Dan Gurney as wheelman, did well until the 96th lap, when it crippled out with a faulty gearbox seal. The other two are completely new in contour, suspension, and steering control.

- Two rear-engine roadsters cradling Buick power plants. These engines are 215-inch aluminum V-8s, bored out to 256. Horsepower is 330 at 6,500 r.p.m. Both cars are sponsored by sportsman Jim Kimberley. One is a Thompson-built sister of last year's Harvey Aluminum Specials. The other is a copy built this year.

- Two rear-engine Lotus "Indy Project" Specials, built by the English manufacturer. Their Ford Fairlane V-8s,

similar in design to a currently offered 289-inch engine, will be sized at 256 inches and generate 350 hp.-plus at a usable range of 6,000 to 8,000 r.p.m.

Maverick V-8s, one from Europe, also are back:

- One Cooper. This is the same English machine Jack Brabham drove so ably in the '61 Indy, finishing ninth in spite of inadequate horsepower. With 167-inch displacement, his unblown Climax V-8 delivered a meager 252 at 6,300 r.p.m. After the race, Brabham said he would have needed another 100 horses to give the competition back-talk on the straightaways. Mexican driver Pedro Rodriguez, winner of this year's Daytona Continental, will get a better break. For an Aston-Martin V-8 engine that wrings 370 horsepower from 275 inches has been installed by the Cooper's present owner, Kjell Ovale.

- Three greatly modified Novi V-8s, championed by Andy Granatelli, a vice-president of Studebaker. For years the Novis have been hard-luck machines. Often they have not even got beyond their qualification laps. The last Novi to compete finished tenth in 1958. Originally built with front-wheel drives, their engines were supercharged.

Sidelined for four years, the Novis are still supercharged, no longer are driven by the front wheels. The cars have been rebuilt. Weight has been reduced from 1,800 to 1,650 pounds. With a new carburetion and supercharger setup, the horsepower of the big-muscled V-8s is smaller but more tractable than last year's 745. It still stands at a whopping 635. Other changes include dual brakes, improved steering, and a radically different type of headrest assembly.

Enthusiasm vs. sobering facts. The optimism of race-car designers is proverbial. But this year it approaches exuberance. Before the '62 contest, Thompson told me he'd be happy if one of his lightweights completed the 200 laps. Today he says: "Now we've got what it takes to win—the perfect team."

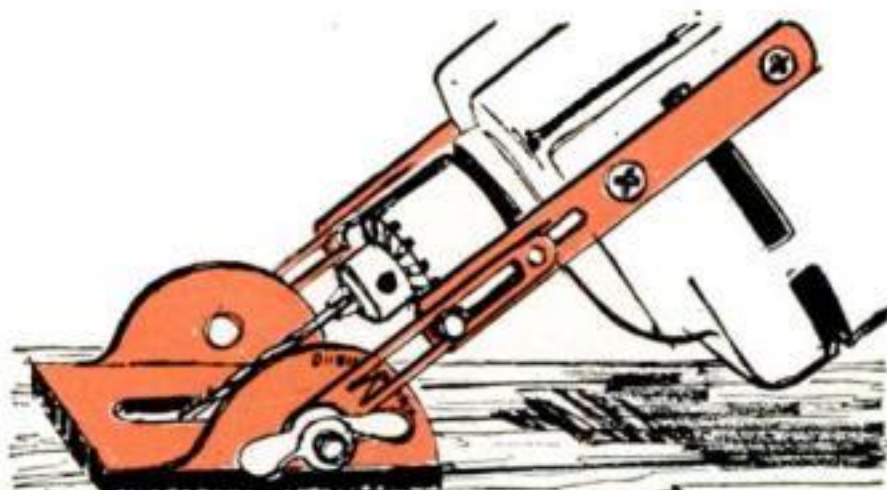
[Continued on page 204]

"I'd like to see them make..."

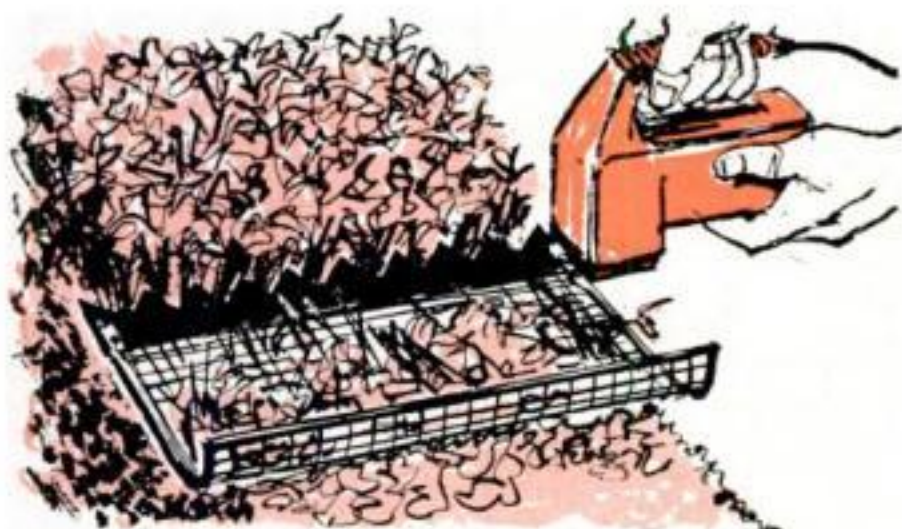
Bug bombs for phone booths that would spray at the drop of a coin. I'd gladly spend a penny to get rid of insects drawn by the light at night.—C. Petzold, Runnemed, N.J.



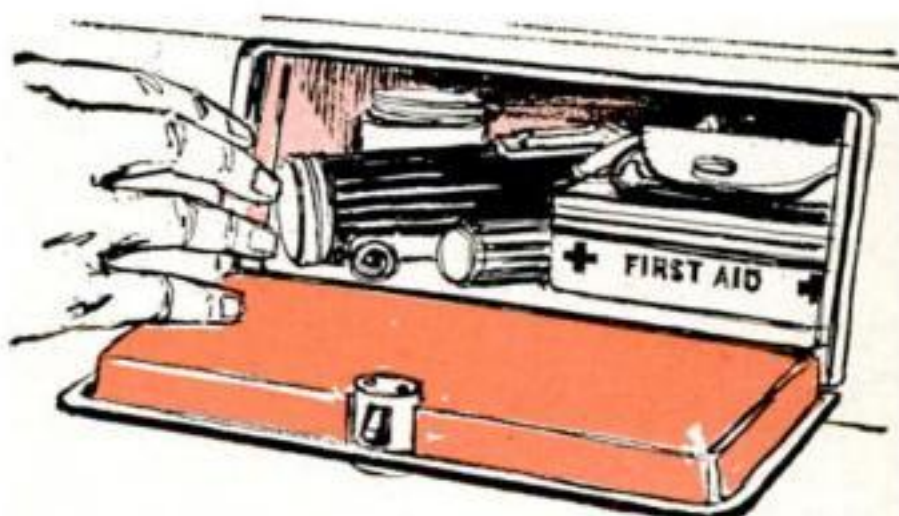
Easy-to-tote fishing gear—fishing net, boat hook, and gaff designed as snap-on heads so you could use 'em all with a single pole.—Anthony J. Santoro, Farmingdale, N.Y.



An angle jig for use with electric hand drills. The arms would telescope as the bit entered the work; graduations could indicate the depth drilled.—R. Knudson, Hanover, N.H.



A clipping catcher for my electric hedge trimmer. It would eliminate the bother of raking up and picking bits and pieces out of the hedge.—R. M. Woodbury, Natick, Mass.



Padded glove compartments in cars. A plastic foam-backed liner would keep hard objects from rolling so readily and rattling against the metal sides.—Art Tussey, Richmond, Va.

Everyone has his own pet idea of a gadget that he would like to see in general use. What's yours? We will pay \$5 for each one published. Please use Government postcards

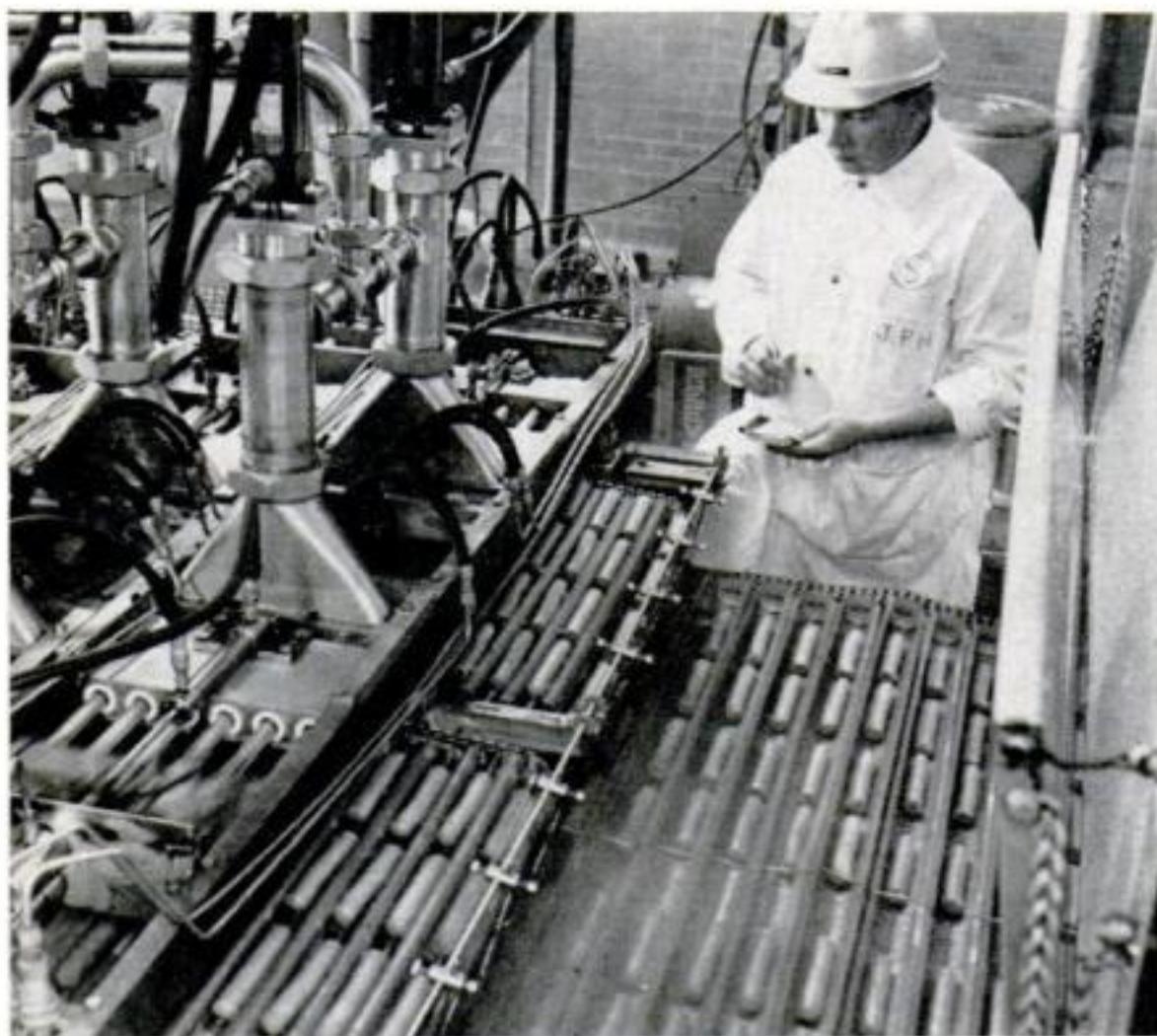
only. Send to ILTS Editor, Popular Science, 355 Lexington Ave., NYC 17. Write your name and address clearly. Contributions cannot be acknowledged or returned.



Navy cruiser launches three missiles at a time

Three surface-to-air test missiles are launched here, for the first time, simultaneously from one ship. A Bendix Talos streaks out from the bow, another from the stern, and a General Dynamics Tartar from amid-

ships. The vessel is the U.S.S. Albany, one of three heavy cruisers newly converted for multiple guided-missile launching. She shows her triple punch off the Virginia Capes before joining the U.S. Fleet.



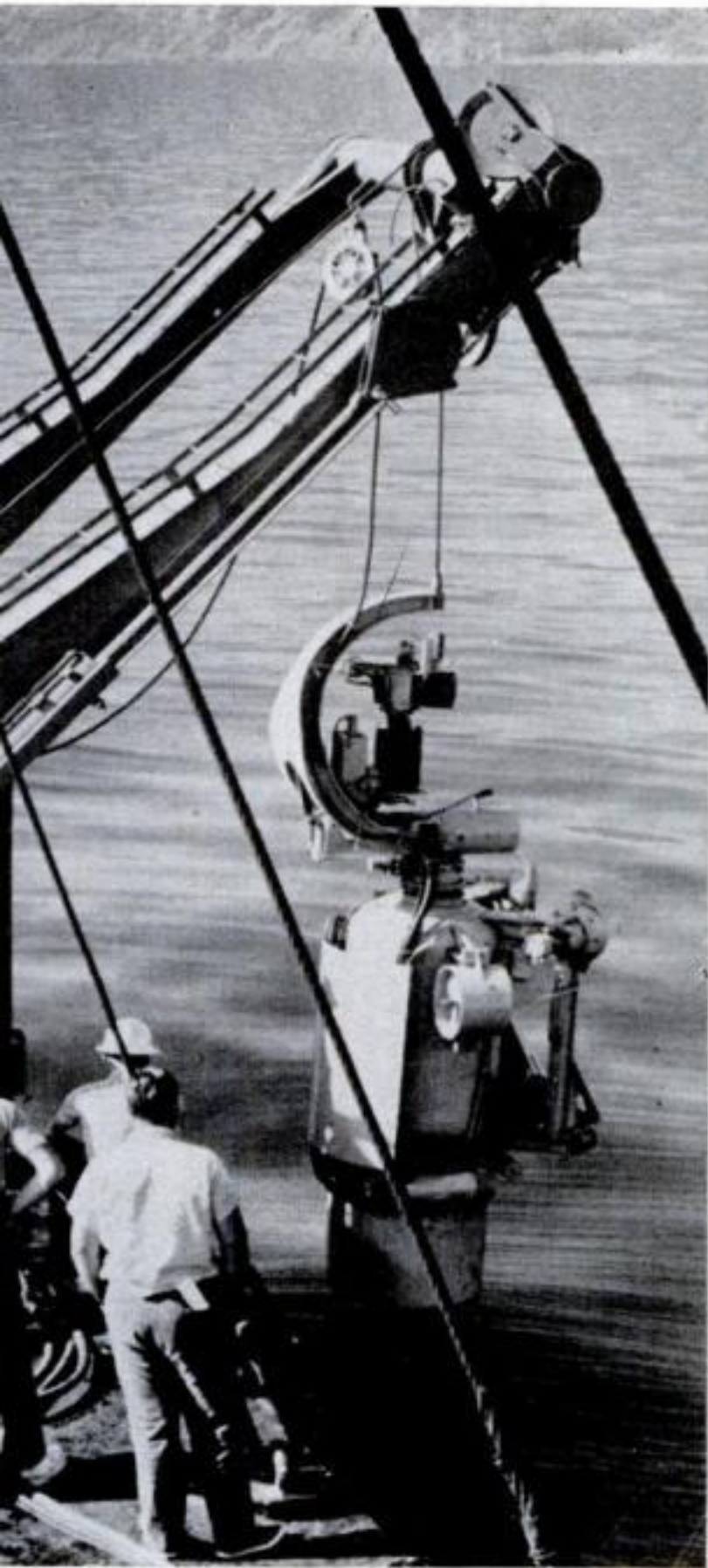
Automation comes to the hot-dog factory

Ground meat goes in at far left, comes out in foreground as frankfurters. The skinless franks are made on electronic machines installed in Swift & Co.'s plants. Meat is pumped in, formed in molds, solidified, and dropped onto the conveyor here which takes the dogs to cooking, smoking, chilling, and packaging stages. No human hands touch them anywhere along the line.



Microwave tower is nation's biggest talker

This building, with its 185-foot tower dominating the Los Angeles skyline, is the Pacific Telephone Co.'s new \$31,000,000 communications center—largest in the country. The tower, called officially a microwave-radio antenna support, has five "horns" on its top. They transmit and receive nationwide teletypewriter, telephone, television, and radio messages.



Diving robot drills for oil under sea

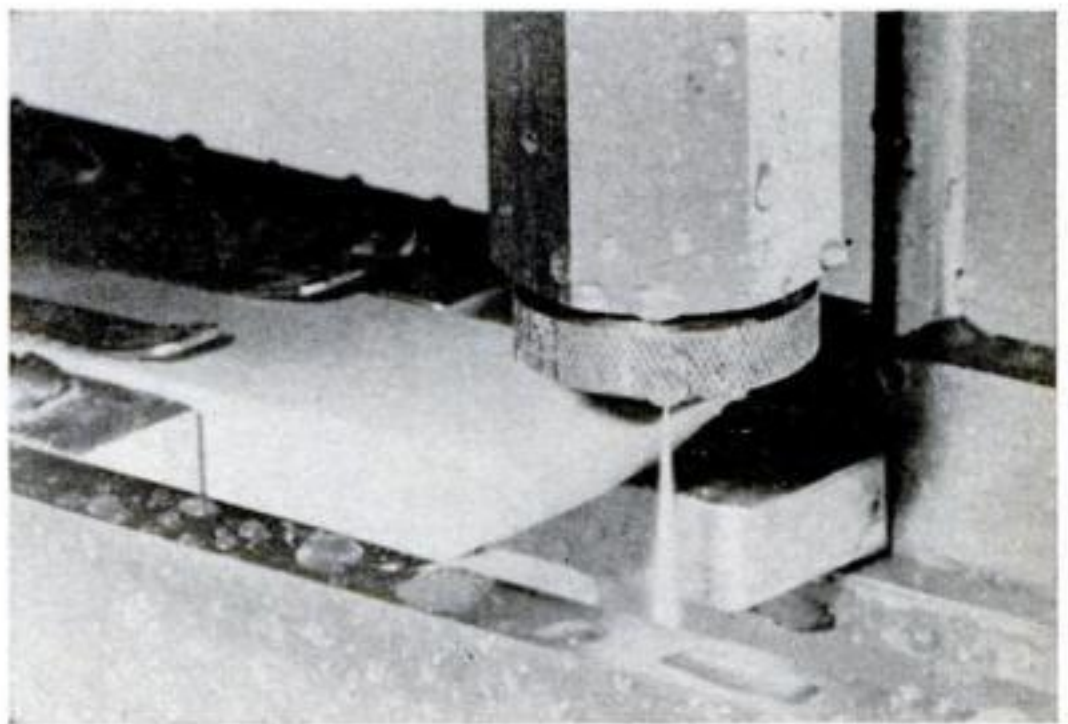
This underwater robot is going down off the coast of California to drill and complete an offshore oil well. Shell Oil's mechanical roughneck can see, hear, and swim; and its arm can turn lock screws, operate valves, grip pipe and hose, or wield a wire brush and other tools just like a man, but by remote television and sonar control from a drilling ship on the surface.

The robot's principal advantage over human divers? It can go deeper—down to 1,000 feet—and stay down longer. Shell expects the system to revolutionize off-shore-oil prospecting.



Wheeled boat rides on land or water

Dubbed the Husky Duck, this car-boat was built especially for hunters and fishermen. It has a plastic-and-wood frame four feet wide and eight long, and rides on six low-pressure vinyl tires with fins on the sides for propulsion. Neumann & Bennetts, Berkeley, Calif., sells it for \$1,395, but if you want to build one yourself you can get plans. Tires sell for \$24.95 without wheel.



Powerful water jet saws through wood

Having drilled holes with a light beam [PS, March], the University of Michigan is now sawing wood with a stream of water. The .01-inch jet in the rig above has a pressure of 50,000 pounds per square inch, moves at a speed of 3,000 feet a second. Here it cuts through a two-inch maple plank, severing the fibers without leaving sawdust.

It happened 40 years ago this month

The First Nonstop Coast-to-Coast Flight

IN THESE days of five-hour transcontinental jets, it seems incredible that the first nonstop coast-to-coast flight was made only 40 years ago.

The plane was a Fokker T-2 with an open cockpit for the pilot, who sat to the left of the 400-hp. Liberty engine, where he could make minor repairs in flight. The copilot sat about 10 feet behind.

The aviators were Lieutenants Oakley G. Kelly, 31, and John A. Macready, 35, of the Army Air Service. Today both are retired Air Force officers.

Twice they took off from San Diego, and twice they failed to complete the flight.

On their first try, fog obscured the mountain passes through which they had planned to fly; and with their plane's 10,000-foot ceiling they couldn't climb over the mountain tops. So they circled over San Diego and set an endurance record of 35 hours, 18 minutes. "We didn't have the nerve to return at once after being handshaked and slapped on the back," Macready said.

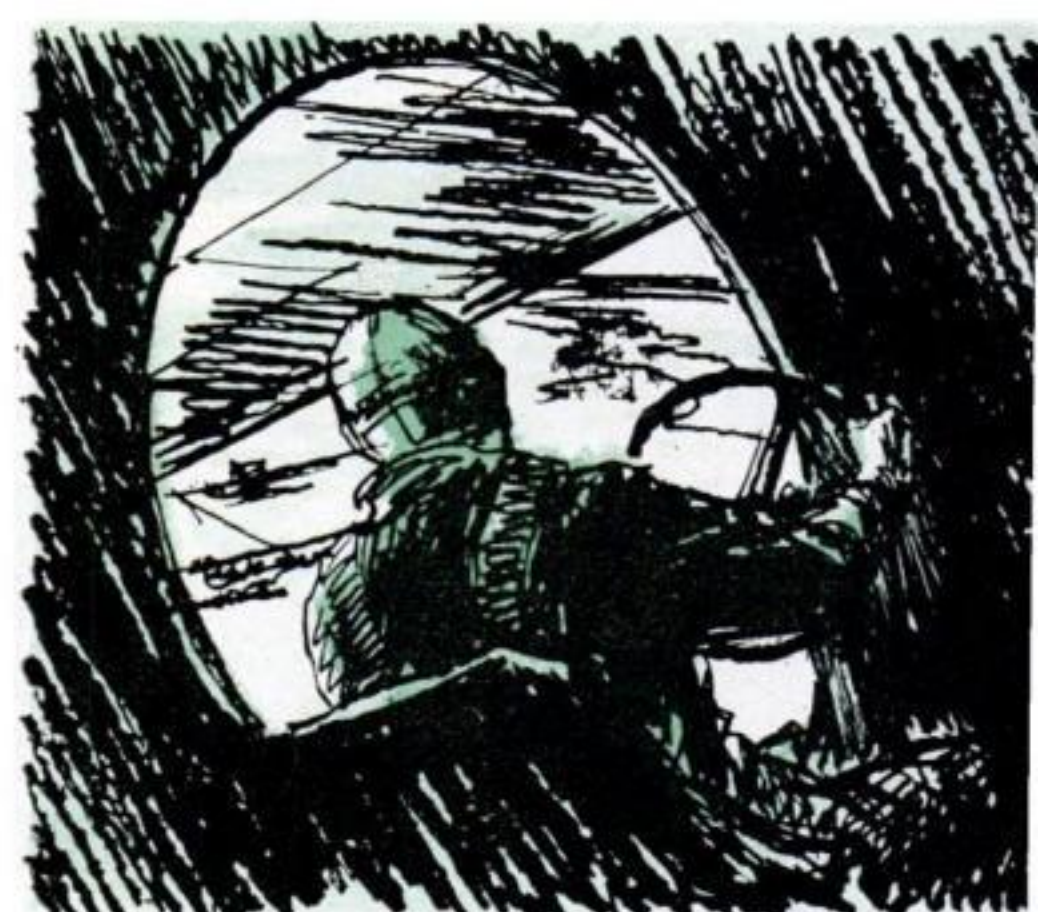
On their second flight, the engine leaked coolant and overheated. They poured in coffee and even consomme, but finally had to land on the Indianapolis Speedway.

On their third try, this time from east to west, they made it.—*Gardner Soule.*



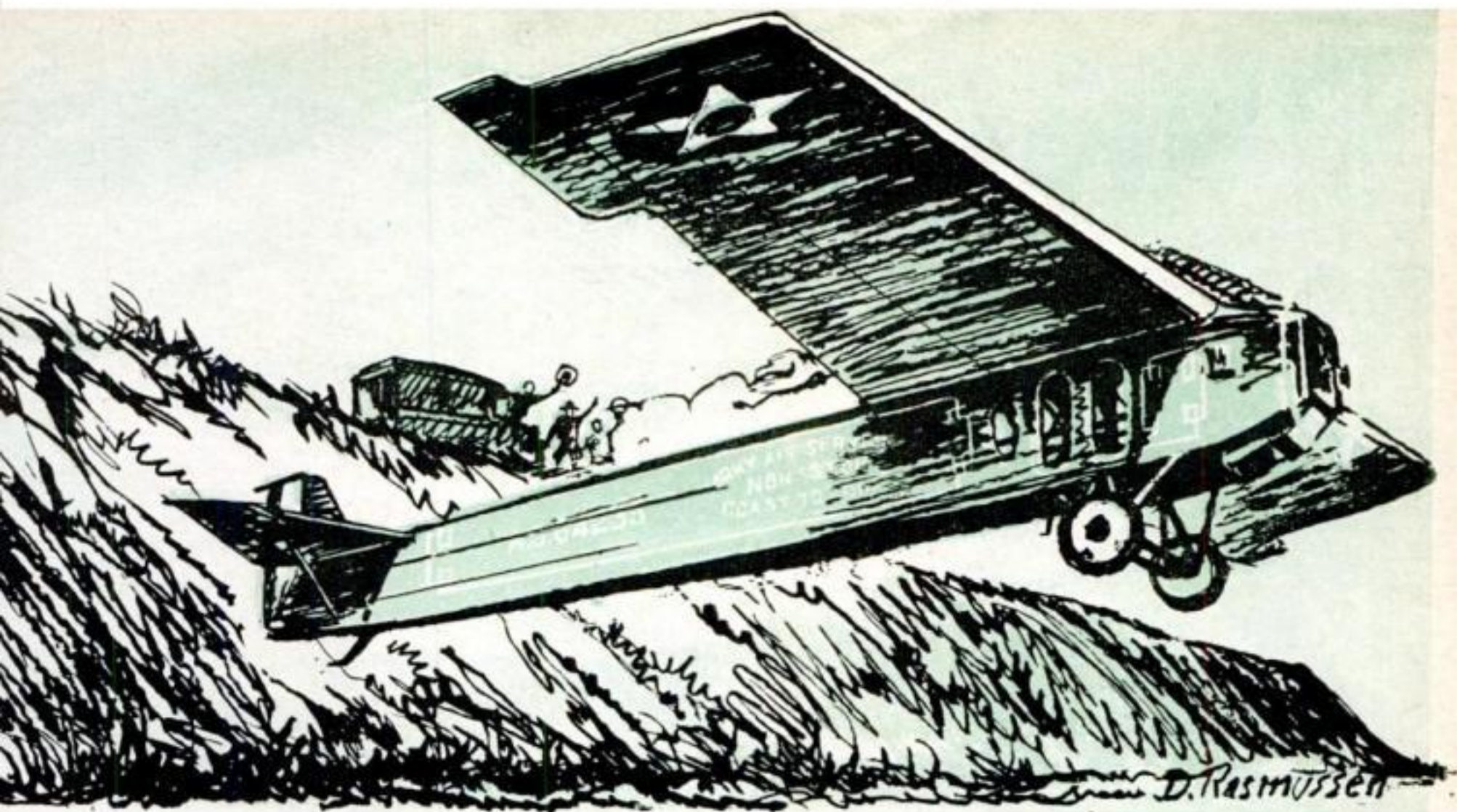
A long struggle to gain altitude

Limping low over Long Island, the overloaded plane skimmed above telephone wires. It managed to climb all the way up to 300 or 400 feet to clear the roller coasters and Ferris wheel of Coney Island. By the time the T-2 reached Pennsylvania, it had gained a little more altitude. Visual navigation was difficult: "Rivers, roads, and railroad tracks wound in all directions," complained Macready, "and the large cities were covered with dense smoke."



Making a repair in the air

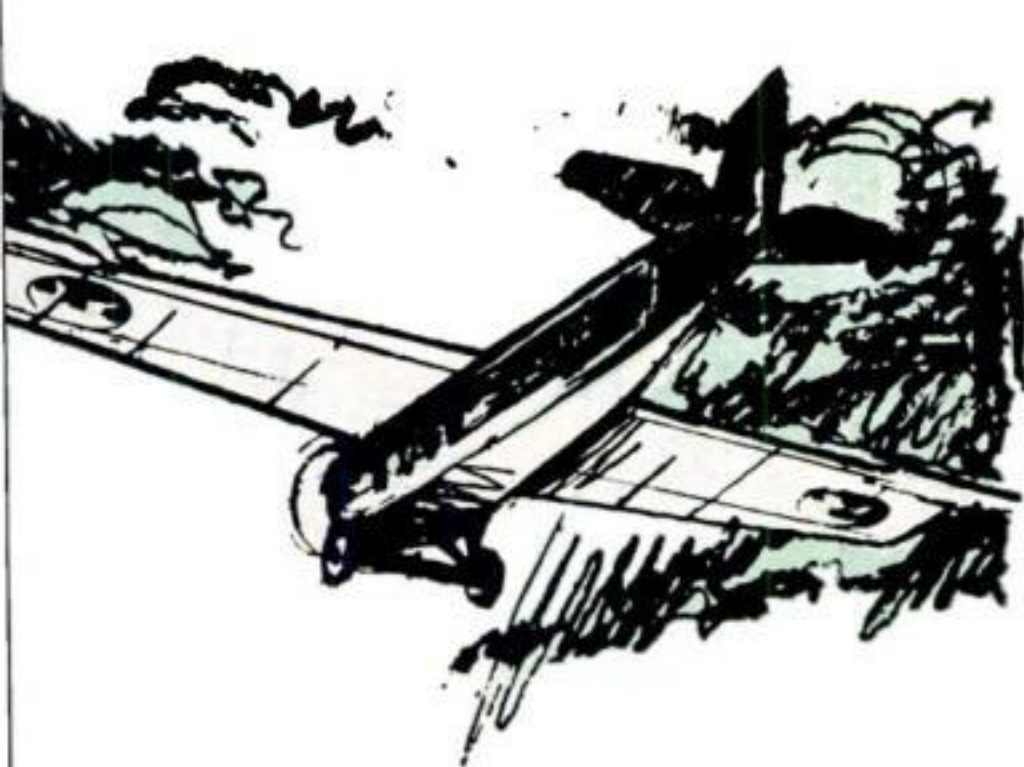
Mechanical trouble came quickly: The engine stopped generating electricity. The batteries would soon be depleted, and the plane would have to land. Kelly removed the voltage regulator and adjusted it—a delicate operation even on the ground. Meanwhile, Macready flew the plane with a second set of controls from the rear seat; he couldn't see ahead or to the right. Within minutes Kelly replaced the regulator. The ammeter registered a charge again.



Start of the historic 2,500-mile flight

On the morning of May 2, 1923, at Roosevelt Field, Long Island, N.Y., Lieutenants Kelly and Macready loaded their T-shaped Fokker with 737 gallons of aviation gas. Ready to fly, the

plane weighed 10,850 pounds. An extra couple of hundred pounds would have kept it on the ground. On the first try, the T-2 failed to take off. On the second try, at 12:36 p.m., it fell off a 20-foot drop-off surrounding the field, climbed out just in the nick of time.



A welcome beacon beckons

Over McCook Field in Dayton, Ohio, their home base, Kelly and Macready dropped a message that they expected to reach their destination, San Diego, by noon the next day. After dark, at Belleville, Ill., a 36-inch, 450-million-candlepower searchlight swept the sky. The beam was off their course, but they flew to it. "The light looked too sociable for a couple of lonesome pilots," Macready reported later. "We couldn't resist heading in that direction."



Night flying across the Midwest

The foggy, murky night hid all but a few faint lights when they flew over St. Louis. Then came the Ozark Mountains, with heavy clouds and an icy rain that kept the flyers wiping their goggles. They flew by compass when landmarks weren't visible. In the darkness they couldn't tell whether a wing was pointed up or down or whether the plane was level. The only clue the fliers had to when they were climbing, said Macready, was a drop in air speed.

CONTINUED



Mammoth mountain roadblock ahead

Across New Mexico, Kelly and Macready stayed on course by following railroad tracks and the Rio Grande River. Over Arizona, the map showed 8,000-foot-high mountains ahead.

The altimeter indicated 10,000 feet, but the T-2 lacked the power to clear the summits, obviously still higher. Desperately the pilots hunted for passes to sneak through. It was tricky business, with the danger of flying into a dead-end pass with a mountain blocking it at the end.



Coming down the home stretch

Ahead was what looked like a giant lava bed. It was an immense forest on a plateau. The T-2 cleared the tree tops by feet. They searched for a pass to Phoenix but couldn't find one. So they flew due west, picking out the lowest mountains. At last they came out of the mountains over a desert. They caught sight of a landmark: the Santa Fe railroad northwest of Phoenix. At 11:35 a.m., they were spotted over El Centro, Calif. There was only about 100 miles to go.



Mission's end, and a rousing welcome

Over San Diego, the fliers banked the T-2 and swung down the main street. The rooftops 100 feet below were covered with 100,000 cheering, hat-tossing people. Factories and ships in the harbor let loose with their whistles. The T-2 had averaged 93½ m.p.h. across the U.S. The men landed at North Island 26 hours and 50 minutes after leaving New York, and had lunch with the C.O., Maj. H. H. (Hap) Arnold, future chief of the Army Air Forces.



Oversize pebbles pass under watchful eyes—just in case a Koh-inoor should lurk among them!

They Fish for Diamonds

Seafaring miners are finding gems worth fortunes beneath the ocean

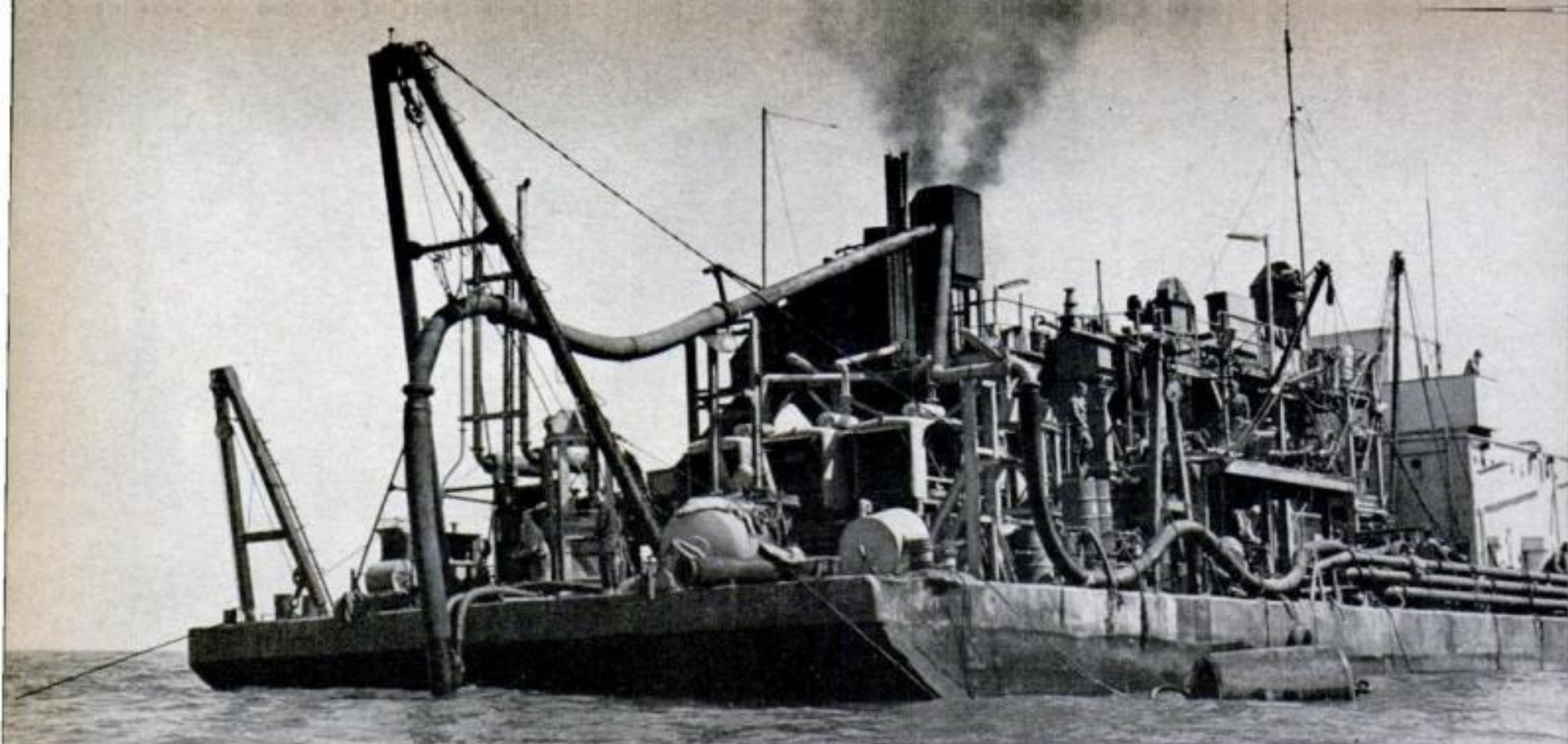
By Alden P. Armagnac

THE diamond that sparkles in a 1963 engagement ring may come from the sea. For one of the strangest mining ventures, a bold project to seek diamonds on the ocean floor off the coast of Africa, has met with success.

CONTINUED



Undersea haul of diamonds includes these sizable trophies of three to nearly five carats—as well as smaller stones in much greater numbers. All these diamonds are of gem quality.



Mining camp afloat, barge Seventy Seven goes into action offshore with 53 men aboard. Typical

In its first three months the enterprise has yielded 11,000 carats of the gems, worth \$3,000,000 at retail.

Three vessels make up the entire mining gear of the Marine Diamond Corp., Ltd., of Cape Town.

A seagoing tug, the 800-ton Emerson K, serves as prospector. Fitted with a tube to suck up samples of the sea bottom, this craft late in 1961 began to cruise off South-West Africa's "diamond coast," from Walvis Bay southward to the mouth of the Orange River. Ashore, the waterless coastal desert of this region has long ranked as a major diamond-mining area where gems by the thousand are found loose in the sand.

The Emerson K promptly confirmed its operators' belief that the diamond field might not end at the beach—by returning with 45 sea-bed gems from pinhead-size up to that of a small pea. Soon a second craft—better suited to recovering the gems in quantity—was exploiting the tug's finds. This is the Seventy Seven, a converted Collins Submarine Pipelines barge.

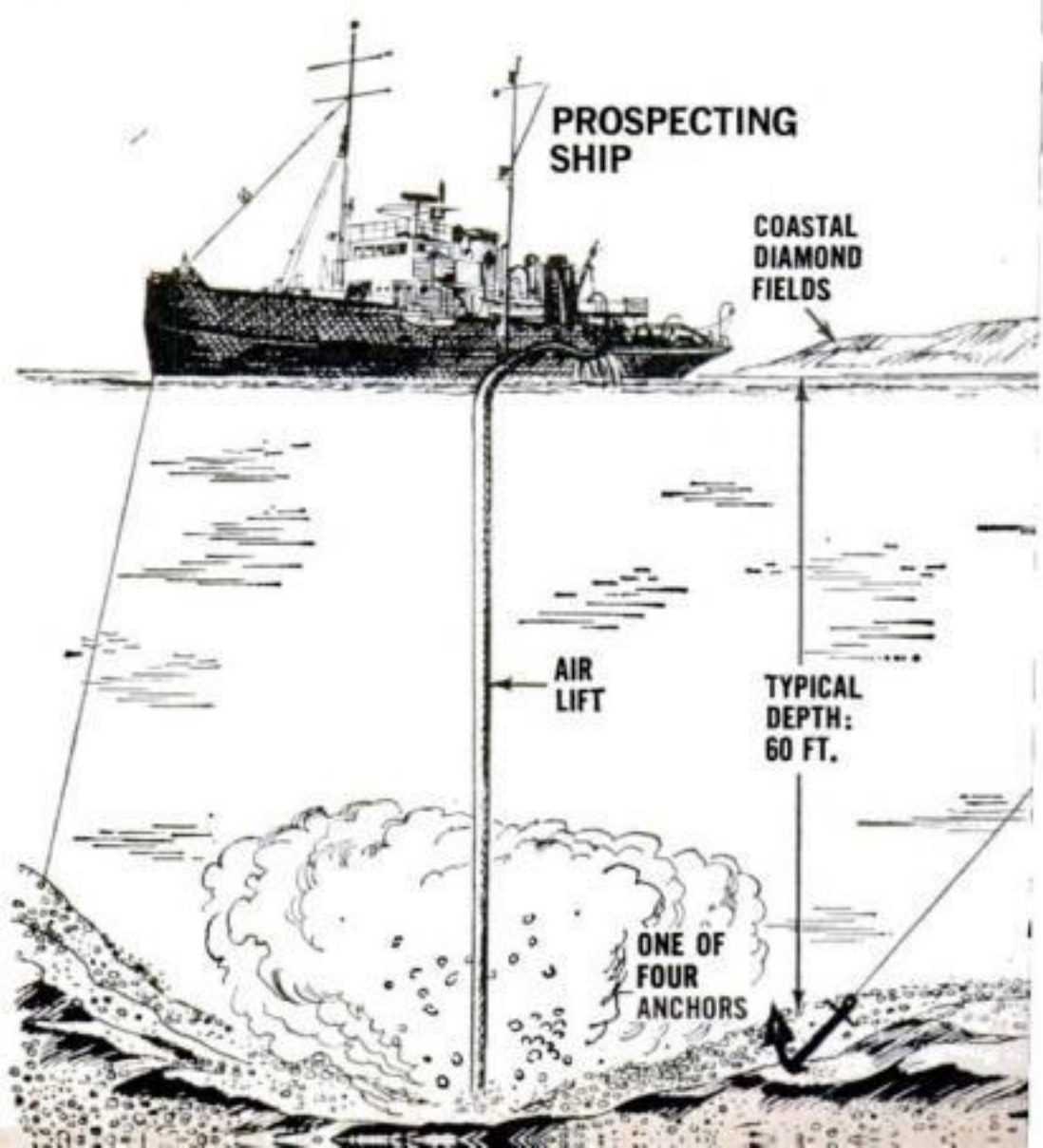
A *floating mining camp*—population, 53—it's towed to a promising spot. It can then maneuver itself over an area of 4,000,000 square feet by means of a special winch and the cables to its four anchors. Meanwhile its "air-lift" pipe

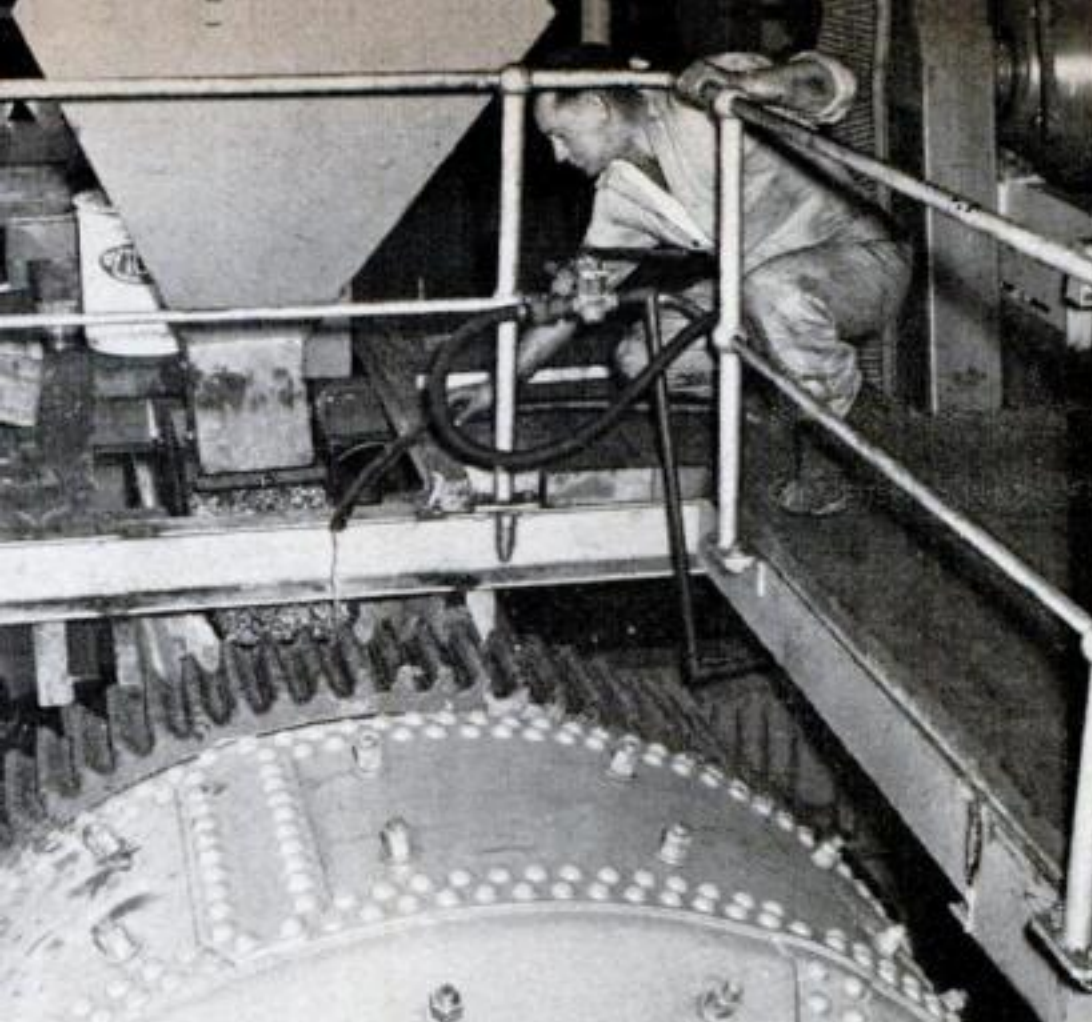
day's haul yields more than 100 carats of diamonds from 50 tons of screened gravel.

brings up diamond-bearing gravel by the ton. A shipboard concentrating plant reduces this bulk until the diamonds can be picked out by hand.

Equipped for a long stay, the Seventy Seven makes its own fresh water and is provisioned for three months. A tender, shuttling between barge and shore, completes the "diamond fleet."

Here's how they mine the diamonds beneath the sea





Ball mill, above, helps remove foreign matter from diamonds. Then jigs take a turn at it.



Hand sorting, picking the diamonds from the concentrate delivered by jigs, is final step.

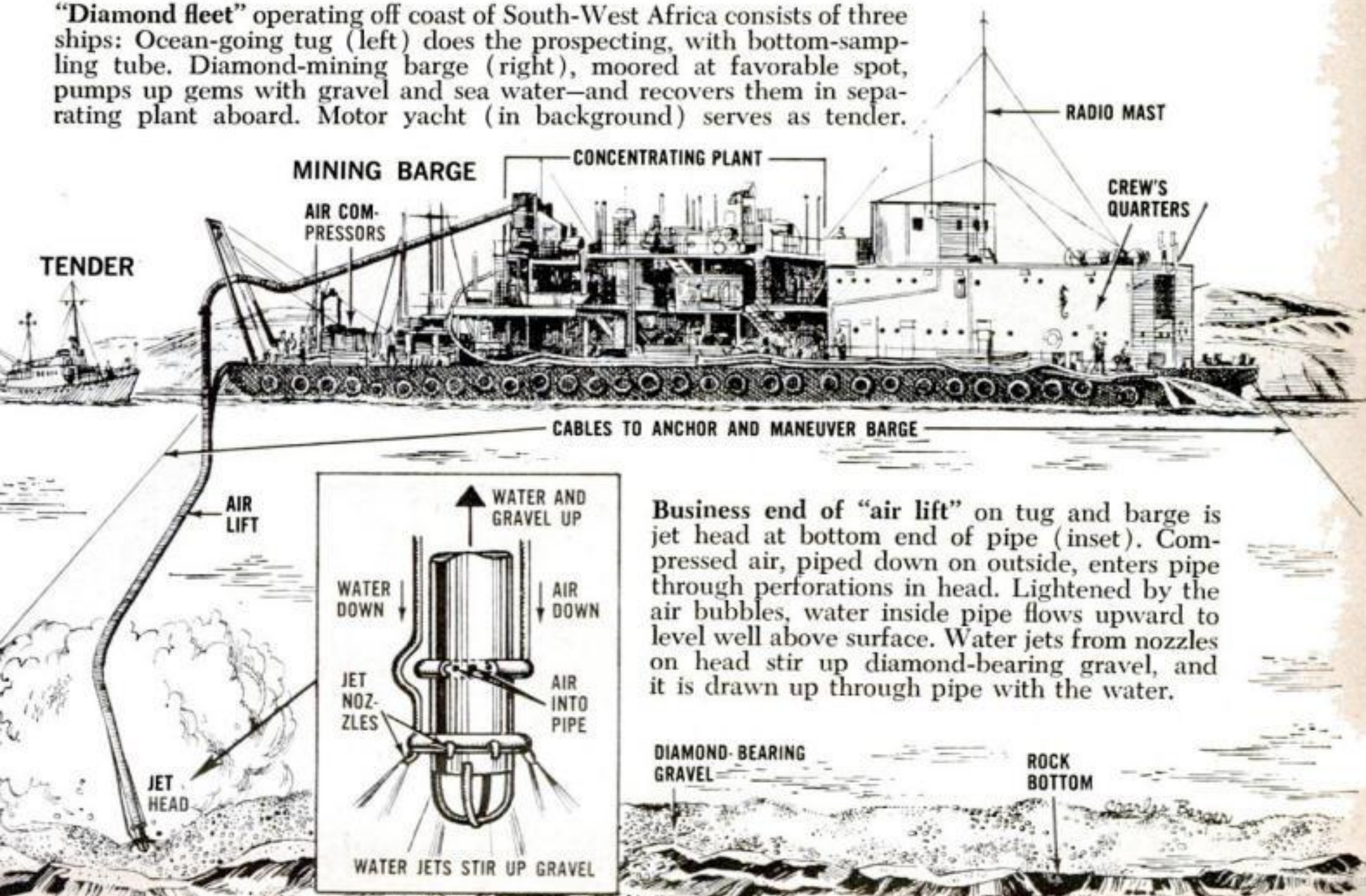
The originator of the underwater mining operation, Sammy Collins of Port Lavaca, Tex., heads a worldwide string of construction firms specializing in submarine pipelines and other underwater projects. His venture into diamond mining, far from an incongruous one, makes good use of this engineering know-how.

The "air lift" that brings up gravel

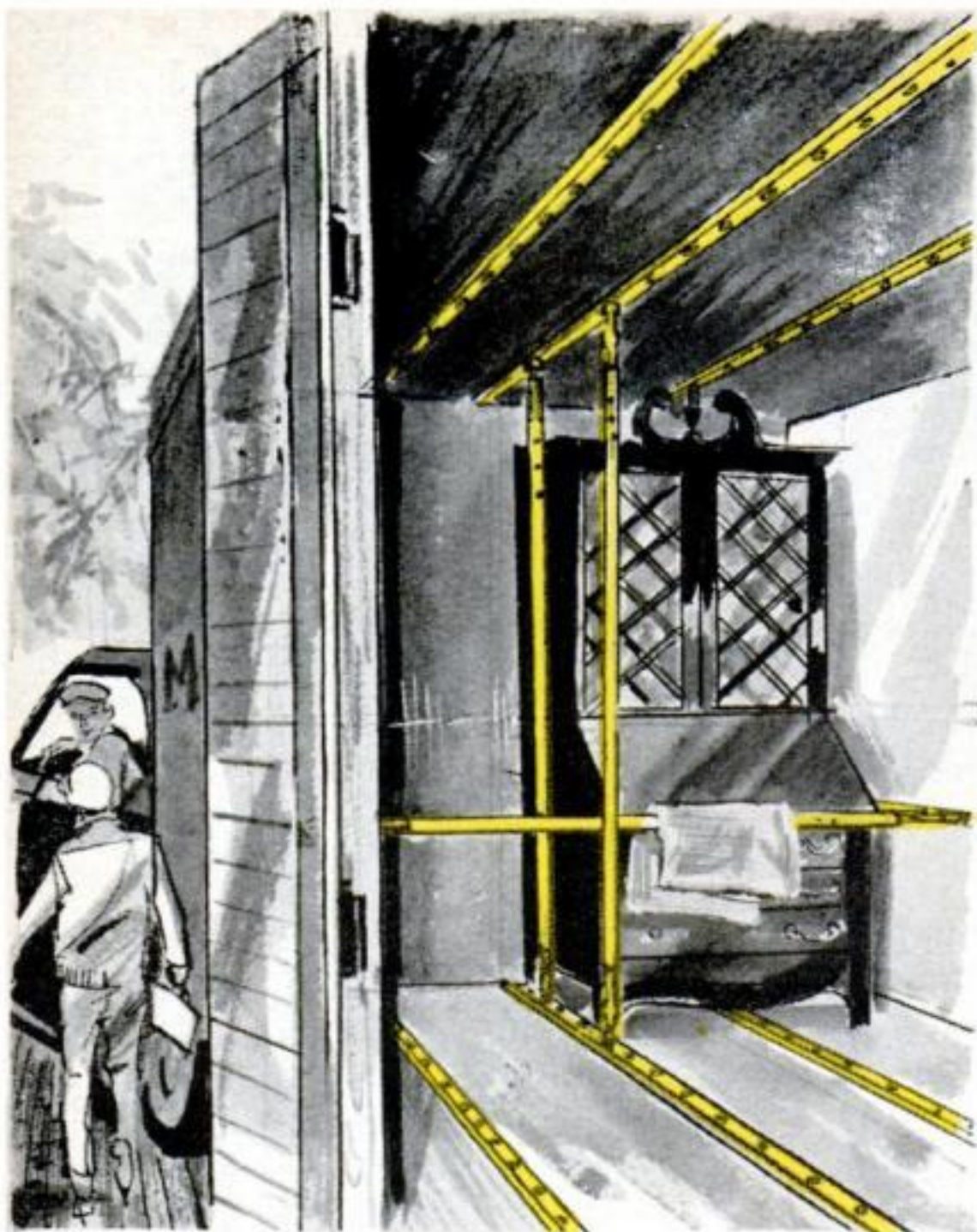
from 100-foot depth or more goes back in principle to one used in Alaska in 1860. A flexible pipe, open at the bottom, descends from the barge to the sea floor. A separate hose carries down air from the barge's compressors, and discharges it into the water-filled pipe. Since the resulting mixture of air bub-

[\[Continued on page 182\]](#)

"Diamond fleet" operating off coast of South-West Africa consists of three ships: Ocean-going tug (left) does the prospecting, with bottom-sampling tube. Diamond-mining barge (right), moored at favorable spot, pumps up gems with gravel and sea water—and recovers them in separating plant aboard. Motor yacht (in background) serves as tender.



Business end of "air lift" on tug and barge is jet head at bottom end of pipe (inset). Compressed air, piped down on outside, enters pipe through perforations in head. Lightened by the air bubbles, water inside pipe flows upward to level well above surface. Water jets from nozzles on head stir up diamond-bearing gravel, and it is drawn up through pipe with the water.



New ideas from the inventors

Rails brace moving cargo. Slotted rails and telescoping, spring-loaded poles, according to this recent patent, might speed cargo handling, reduce in-transit damage, lessen the need for crating. The rails would be fastened to roof, floor, and sides of a truck or freight car. Snapping pole ends into holes would keep the cargo from shifting.



Freezer signal warns of thaw. This indicator would tell if power failure had caused a dangerous temperature rise in your freezer—and for how long. After freezing the sealed-in liquid, you'd invert the clear-plastic cylinder. Thawed liquid would drain past a supporting spider into the time-calibrated lower half.



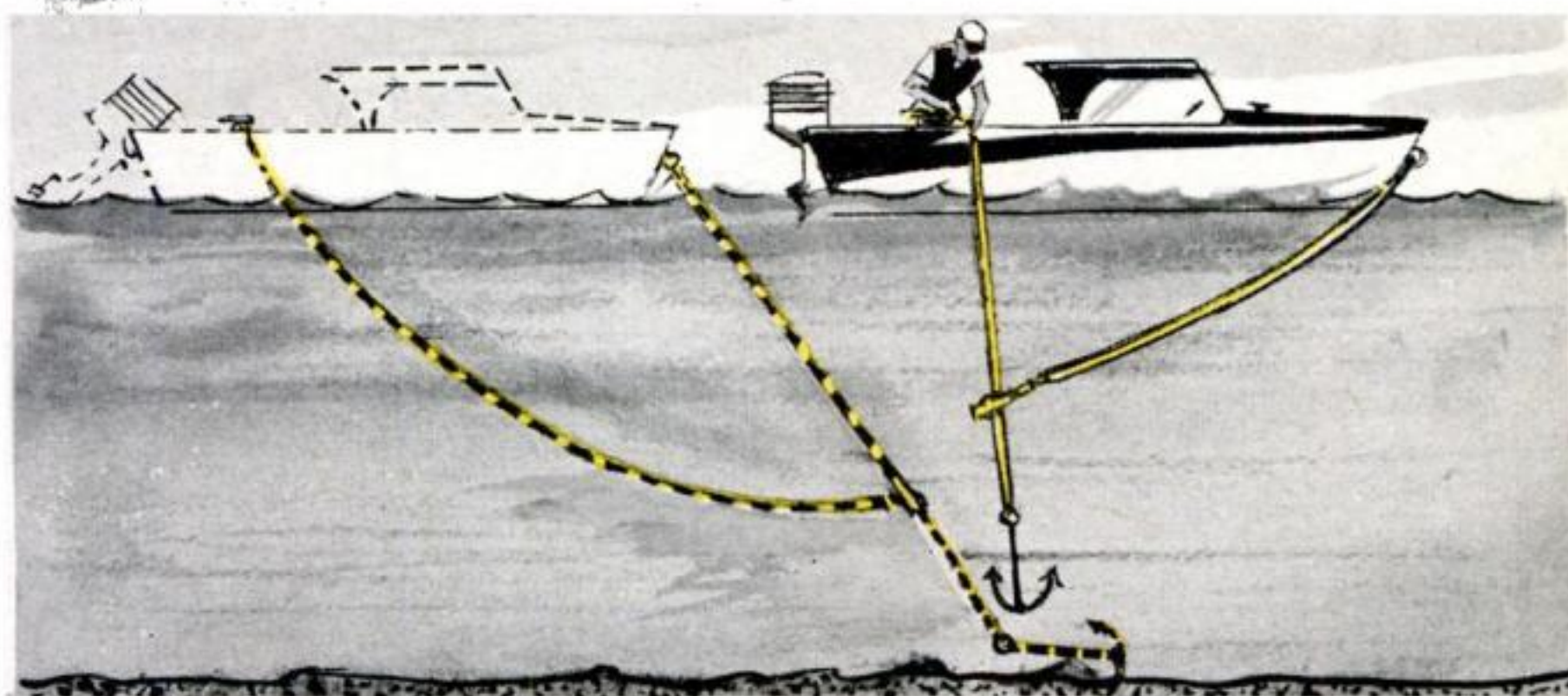
Glasses light your work. Tiny bulbs above the lenses of these spectacles—and batteries in the earpieces—would put light where you want it and let you use both hands. Opaque reflectors behind the bulbs would focus the light and keep it out of your eyes. Switches in the frames would let you use either or both lights.



Suitcase grows with load. Add-on sides that could be carried folded inside this suitcase would let you increase luggage capacity as you needed it. Zipper tracks around the main case would engage tracks on the add-on units. Long loops on the side sections would slip through the main carrying-case handle.



Brake spins tail-light beam. A brake light might flash a more urgent and unmistakable warning if it were housed inside this slotted, motor-driven sleeve. Applying either the foot or hand brake would cause the sleeve to spin and thus give an apparent whirling motion to the light that is bounced rearward by a reflector.



Hitch hauls anchor from stern. You wouldn't have to clamber forward to cast or haul this anchor. Its line would let out from the stern through a Venetian-blind

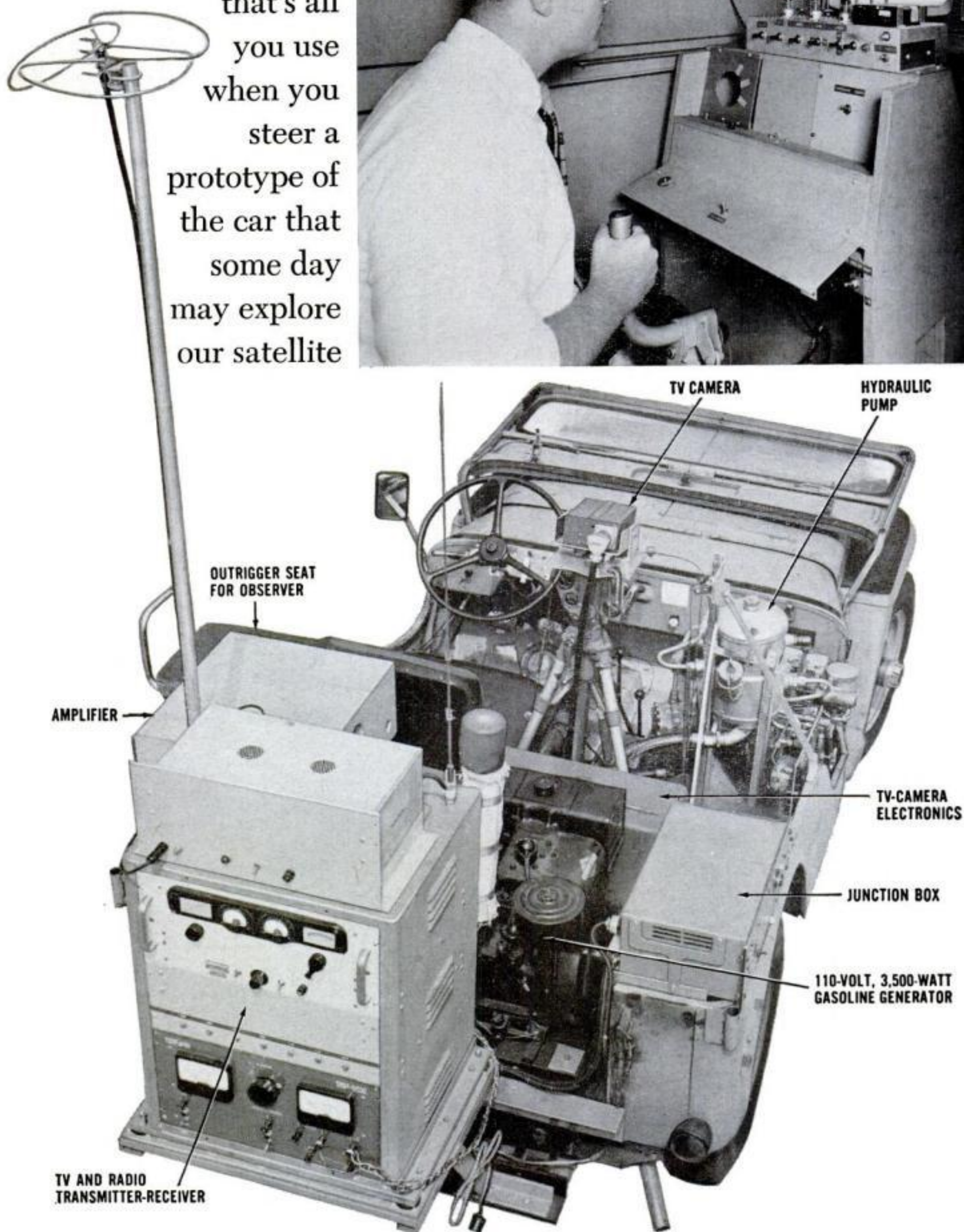
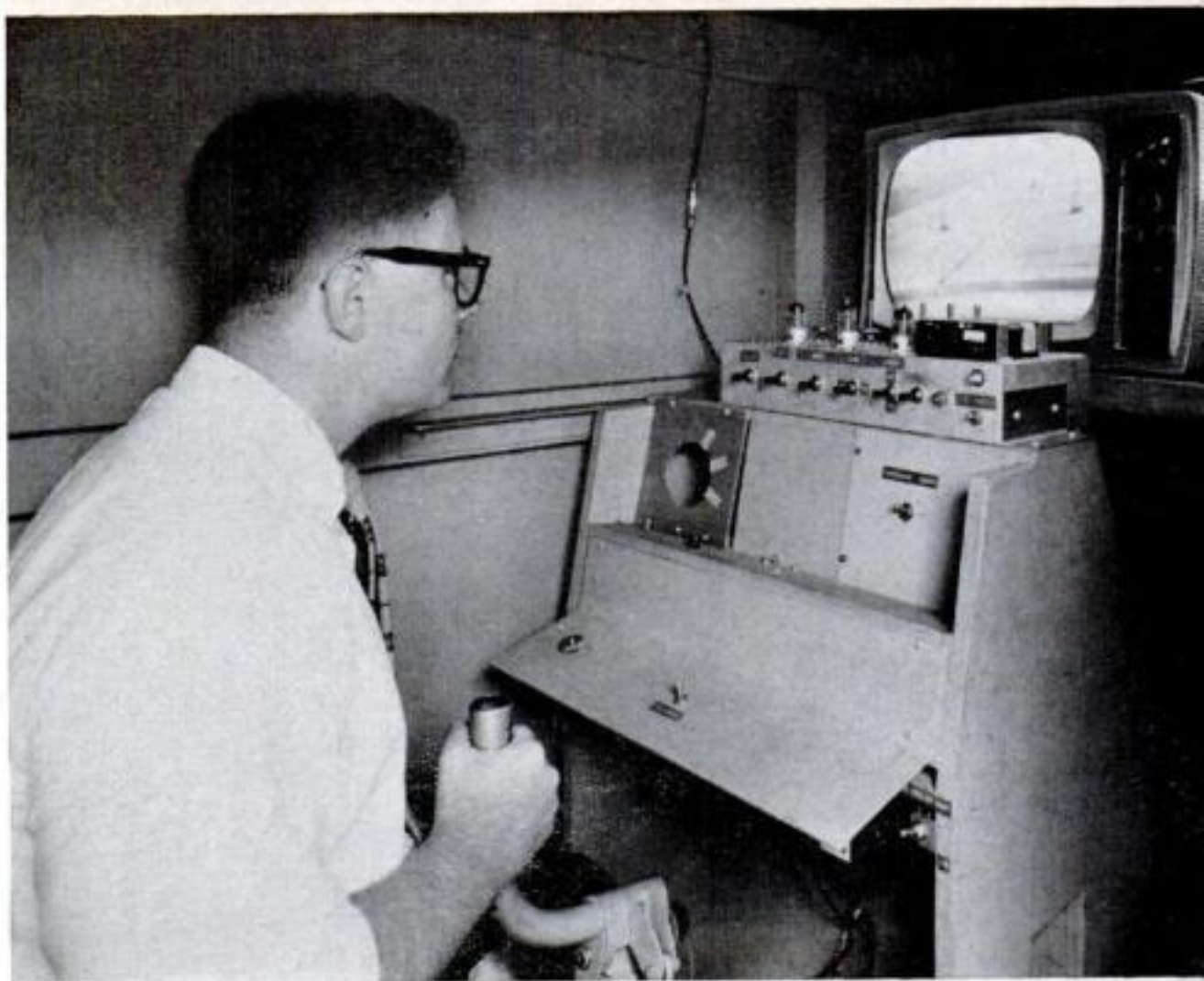
type of one-way slide. A fixed-length bowline tied to the slide would hold the anchored boat in the usual way. To haul anchor, you'd pull forward, then up.

The following patents have been issued on these inventions. Cargo brace—No. 3,062,157 to M. A. Woods, Franklin Park, Ill.; Freezer signal—No. 3,063,235 to P. Winchell, Whitestone, N.Y.; Eyeglass light—No. 3,060,308 to A. J. Fortuna, Clinton, Ind.; Add-on luggage—No. 3,061,057 to C. S. Miller, Philadelphia; Spinning brake light—No. 3,054,983 to A. W. van

Oosten, Delft, Netherlands; Two-line anchor—No. 3,062,168 to J. C. Backe, St. Petersburg, Fla.

Copies of patents may be ordered, by number, from the Commissioner of Patents, Washington 25, D.C., at 25 cents each. To write to an inventor, if the address given above is insufficient, address him (by name and patent number) in care of the Commissioner of Patents.

A joy stick and closed-circuit TV—that's all you use when you steer a prototype of the car that some day may explore our satellite





Watching a TV monitor to see where the Moon jeep was headed, I steered the vehicle remotely by pushing a hefty control stick to the left or

right. The jeep's route was a twisting 440-foot-long course marked by pairs of rubber cones set 12 feet apart. Lots of room, I figured.

I Drove a Jeep "on the Moon"

By Erik H. Arctander

THE TV screen in front of me cast a dim light in the dark cubicle. I sat on a stool, grasping an aircraft-type control stick in my hand. I was about to steer a jeep I couldn't see or hear over a zigzag course 12 feet wide and 440 feet long.

To make it harder, every change-of-direction signal would be delayed. I'd have to make each steering correction $2\frac{1}{2}$ seconds before I wanted it to take effect.

Why was this weird challenge to human skill devised? Not out of idle curiosity. Grumman Aircraft engineers want to find out how an unmanned vehicle can be guided over the moon's surface by remote control. A TV camera on the

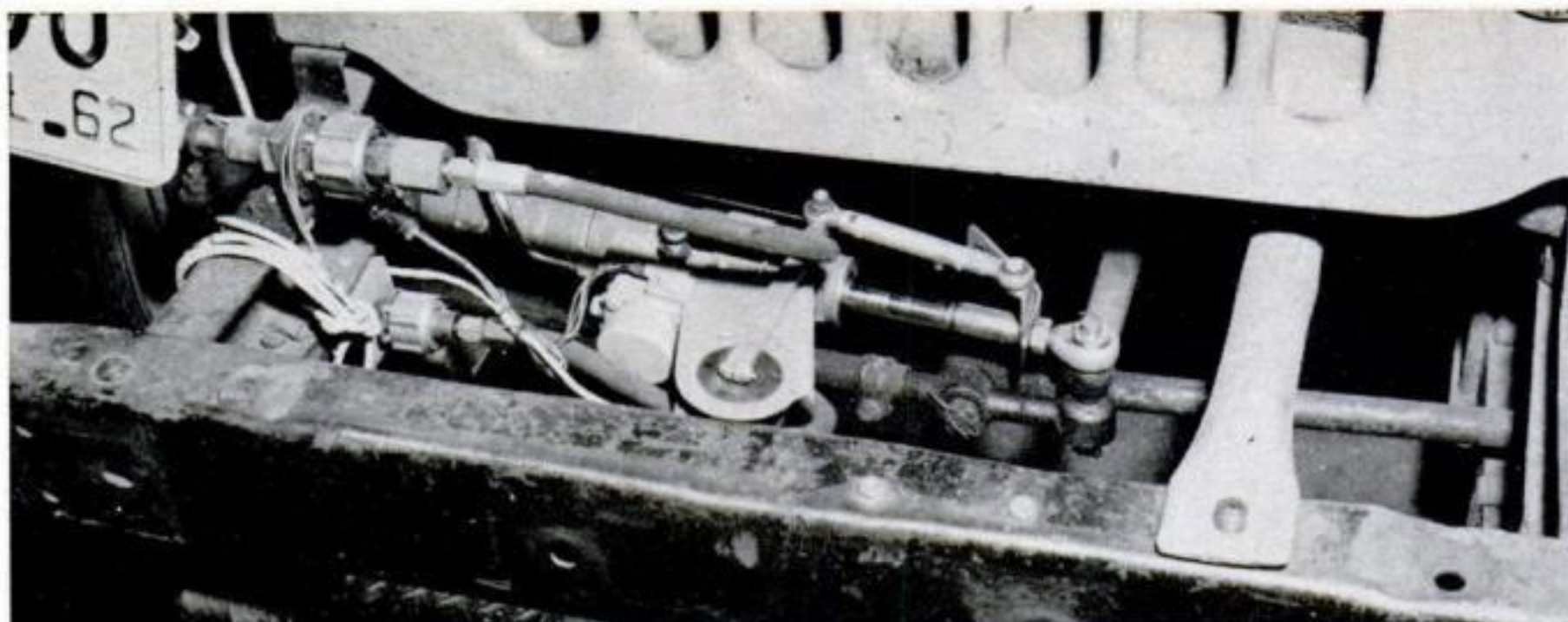
vehicle there would broadcast pictures to earth; from here, a "driver" could send back signals to control the vehicle.

The reason for the time delay on the test apparatus: Radio signals take about $1\frac{1}{4}$ seconds to span 239,000 miles—the average distance of the moon from earth. Round-trip time for a signal to reach the vehicle and for the result to show on the TV monitor is $2\frac{1}{2}$ seconds.

My test run was about to begin. I sat in a blacked-out cubicle—a small trailer on an unused airstrip outside the vast Grumman plant in Bethpage, Long Island.

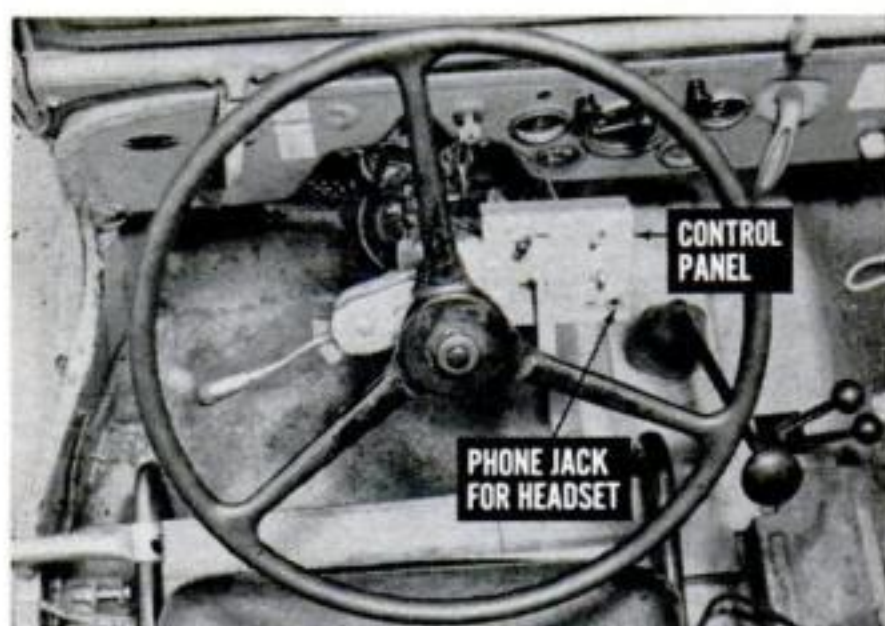
The moon vehicle was a specially altered jeep dubbed Luna-tick I. The test would be at "high" speed: The governor in the jeep was set for 4.25 m.p.h.

Suddenly two columns of rubber cones

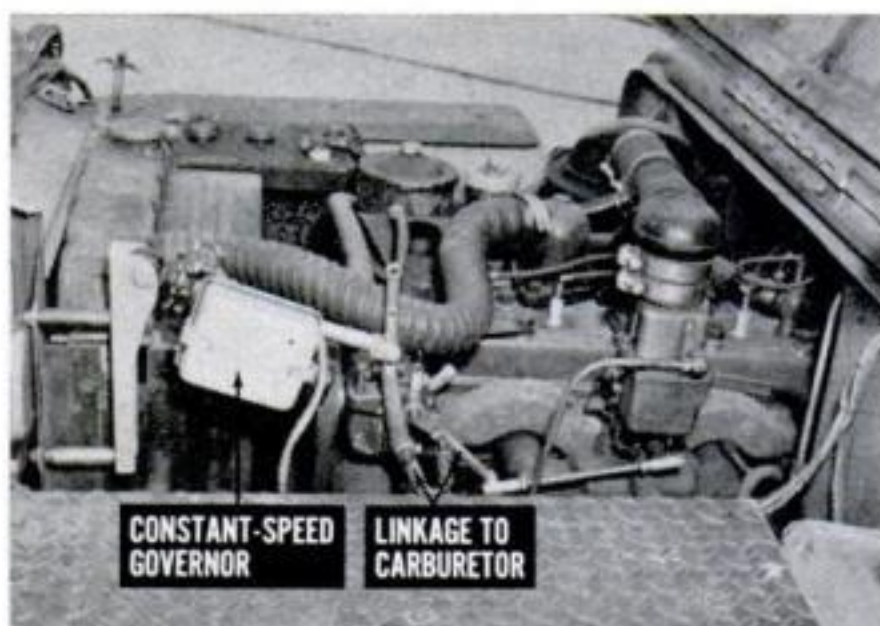


Steering is by a hydraulic cylinder that was originally designed to actuate an airplane wing

flap. A 1,500-p.s.i. pump provides the power; servo motors relay the control signals.



Dash switches allow manual control. Observer in jeep took over when I completed each run.



Governor is set by hand. It permits three constant speeds: 1.4, 3.1, or 4.25 m.p.h.

moved on the TV screen. The jeep had started through the twisting course lined by the cones.

The pair of cones marking the first turn spread apart on the screen. When they were at opposite edges of the screen, I shoved the control stick left against stiff spring pressure, then quickly brought it back. The two nearest cones disappeared off the sides of the screen, but the jeep continued straight ahead.

Just as all seemed lost, the front end of the jeep, visible at the bottom of the screen, swung sharply left.

The next pair of cones was off to the right. I jabbed again at the stick. After an agonizing $2\frac{1}{2}$ seconds, the jeep swung right. Three new pairs of markers lined up on the screen.

It soon became apparent that I hadn't gauged the last turn so well. The jeep was too far right. I scraped past the first

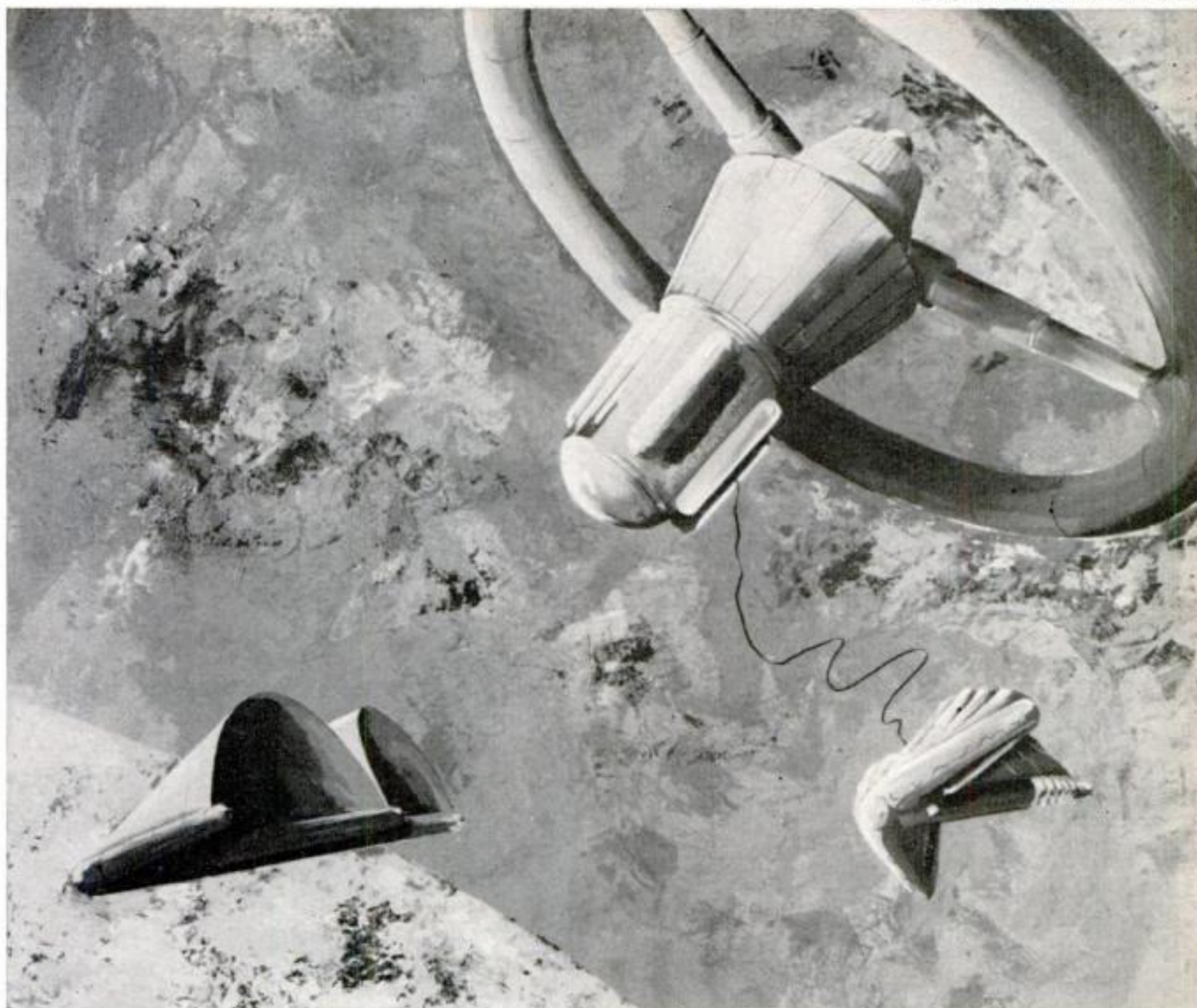
right-hand cone, crushed the second, and went off the "road"—passing on the outside of the third.

I remembered that the course veered left at this point. I shoved the stick hard over and held it there a few seconds. It was sheer guesswork, but $2\frac{1}{2}$ seconds later the jeep swung violently to the left and straightened out smack on the centerline.

The rest of the run went beautifully except for a single miscue that flattened a cone. I was relieved when the run was over; it had been an exhausting 70 seconds.

The hardware: no problems. Russ Hagerman, a project engineer for the Lunar Roving Vehicle, has few doubts about hardware for exploring the moon. Remote-control devices and self-propelled vehicles, he says, are highly de-

[\[Continued on page 178\]](#)



Paraglider "lifeboat" for safe return from orbit

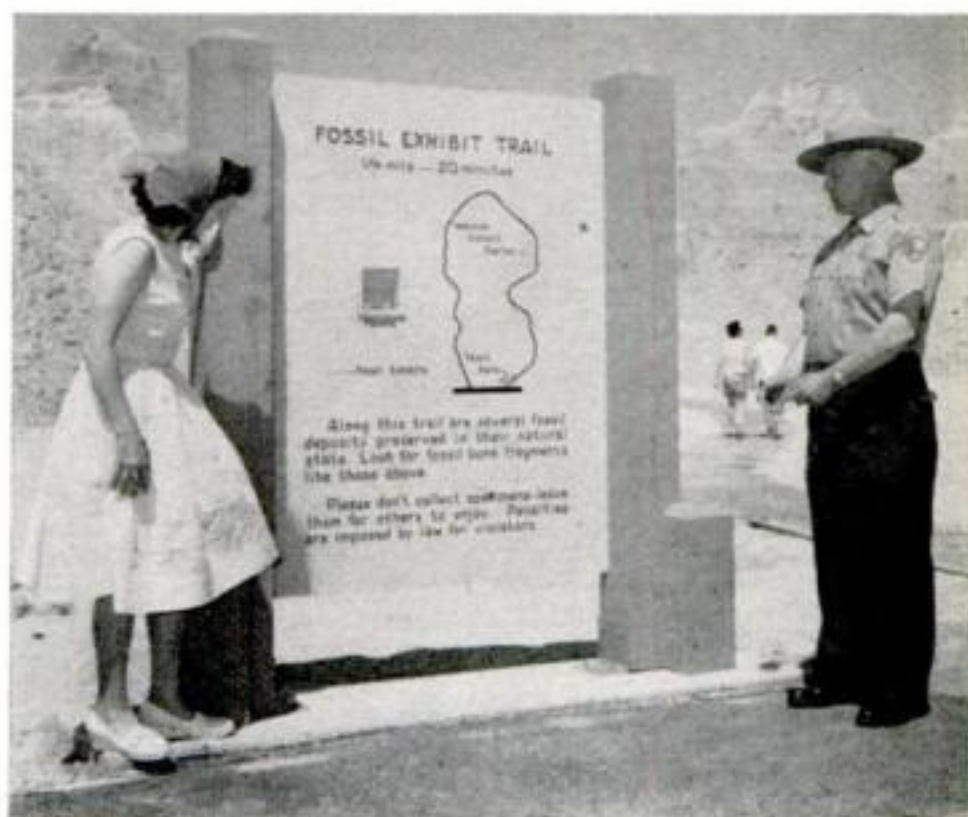
When a man's duty tour in an orbiting space station ends, he'll want to get back to earth safely. Space-General Corp. proposes fitting inflatable glider wings on tubes that would be resistant to re-entry heat.

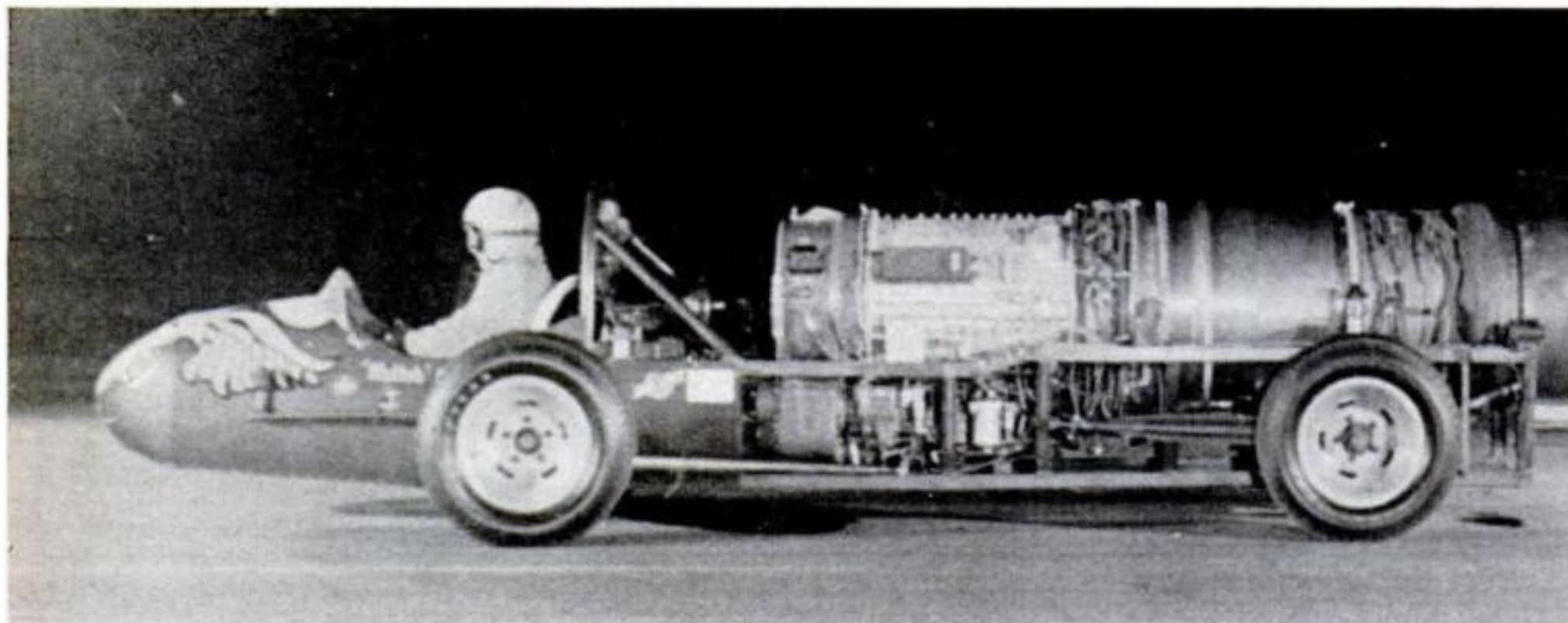
They would be released from the station for return and retrorocketed out of orbit. Two of the one-man space lifeboats are shown above: one gliding towards the earth (left), the other being inflated.

Prehistoric nature trail

The entrance to a unique nature trail displays a map of the route and a sample of exhibits to be found. Along the trail, visitors to the Badlands National Monument in South Dakota see 30-million-year-old fossils of the Oligocene period left in their natural setting but protected by clear-plastic domes. Among them are bones of both extinct mammals and ancestors of some present-day animals.

The trail, off Alt. U.S. 16-A near Norbeck Pass, is a quarter-mile long, takes 20 minutes in an unhurried walk. It was opened to tourists last summer.





Flame shoots out up to 50 feet, barring races with other cars. Crosswinds make car skittish

Jet car burns up the drag strips

A high-pitched whine, a loud roar, and this jet dragster has covered a quarter-mile—just seven seconds after leaving the starting line. Speed: 240 m.p.h.

Walter Arfons of Akron powers his Green Monster with a Westinghouse J-46 turbojet that delivers 6,000 pounds of thrust—about 7,000 hp. A governor keeps it at half throttle; wide open, the car could do 325 m.p.h., Arfons believes.



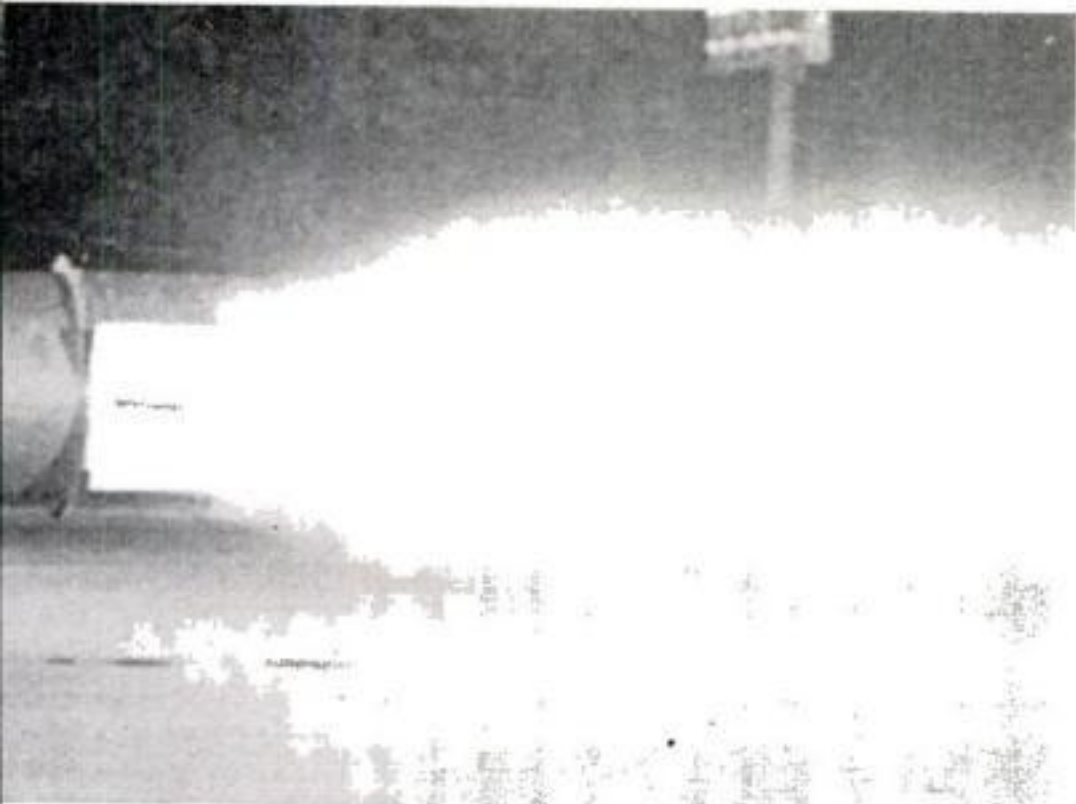
Dash houses 10 gauges, including tachometer, ammeter, and exhaust-temperature and power-brake-pressure gauges. Steering "wheel" is a cutaway competition model for dragging.



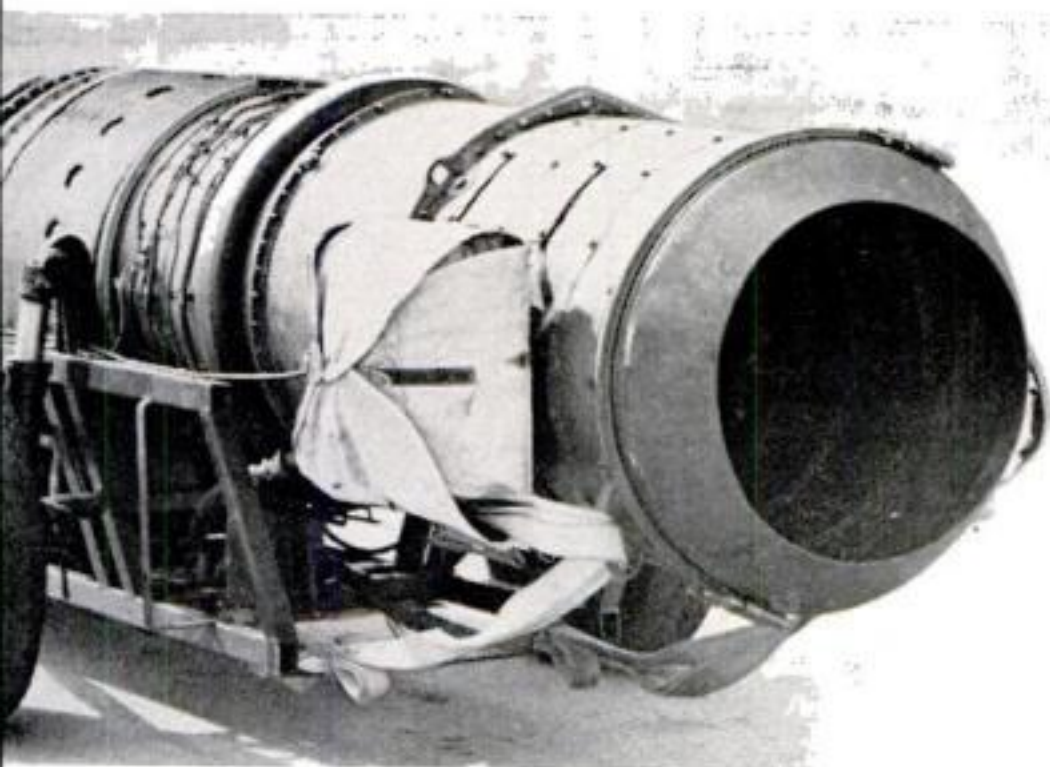
Slot-machine dining adds automation to railroad

Automats on wheels supply quick-lunch service to coach passengers on Southern Pacific trains. They are converted sleeping cars, with tables and chairs at the ends and banks of coin-operated food-vending machines in the center. They operate on a 24-hour basis.

Sample menus and prices: soups and salads, 30 cents; sandwiches, 50 cents; hot plates, 85 cents; fruit juices, 25 cents; rolls and cereals, 15 cents; pie and cake, 25 cents; ice cream, 15 cents; coffee, tea, and milk, 15 cents.



at high speeds, so wind is checked beforehand.



Business end of tailpipe carries a 16-foot aircraft parachute on either side to help stop the 3,000-pound dragster at end of run. Independent suspension gives good handling.

Floating lawn mower chops water hyacinths

Flowers are cultivated for beauty by many a gardener, but to Warren G. Grimes they're a nuisance—when they are water hyacinths choking the lake around his Delray Beach, Fla., island home.

To control the water pest, he rigged up a chopper on an outboard pontoon boat. It consists of 50 knives on a rotor chain-driven by a four-cylinder tractor engine. It cuts the plants to bits four inches below the surface.



Photofloods on vending machine

Shutterbug tourists will find the West German city of Brunswick a photographer's paradise. For their convenience, the front of St. Catherine's Church lights up at night—with the deposit of 50 pfennigs (13 cents) in a box in front that looks like a parking meter. The floodlights it controls provide illumination long enough for several shots.

A personal-use report on the Heath Hi-Fi TV Kit

By Hubert Luckett

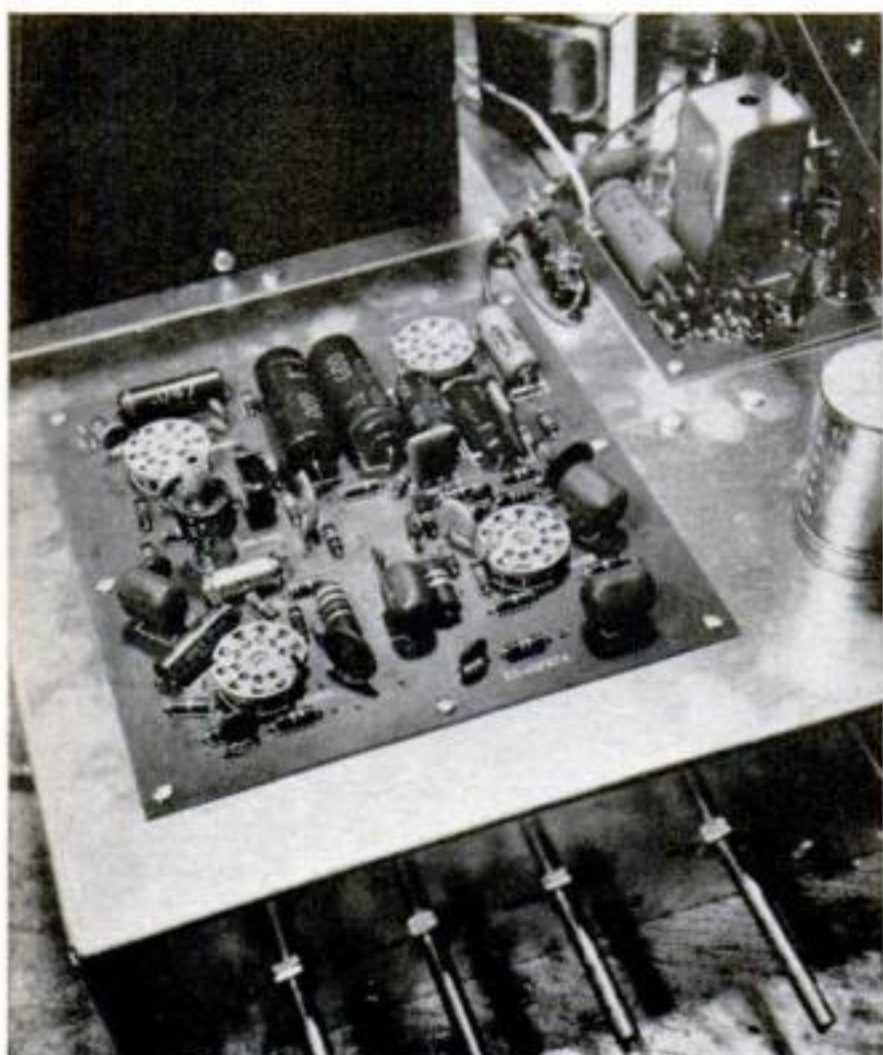
"I'VE never seen a TV picture like that. It looks like a fine photo enlargement. What's the trick?" My friend was talking about the picture on a TV set sitting on my workbench. A few hours before—13 working hours to be exact—that same set had been a paper bag full of parts plus a few subassemblies.

With this kit, the Heath Company has made an all-out effort to provide a TV receiver that will play in the same quality league as hi-fi sound systems. They have succeeded. There are no tricks, no new inventions or scientific breakthroughs. But the picture is markedly superior to the one most people watch on ready-made sets.

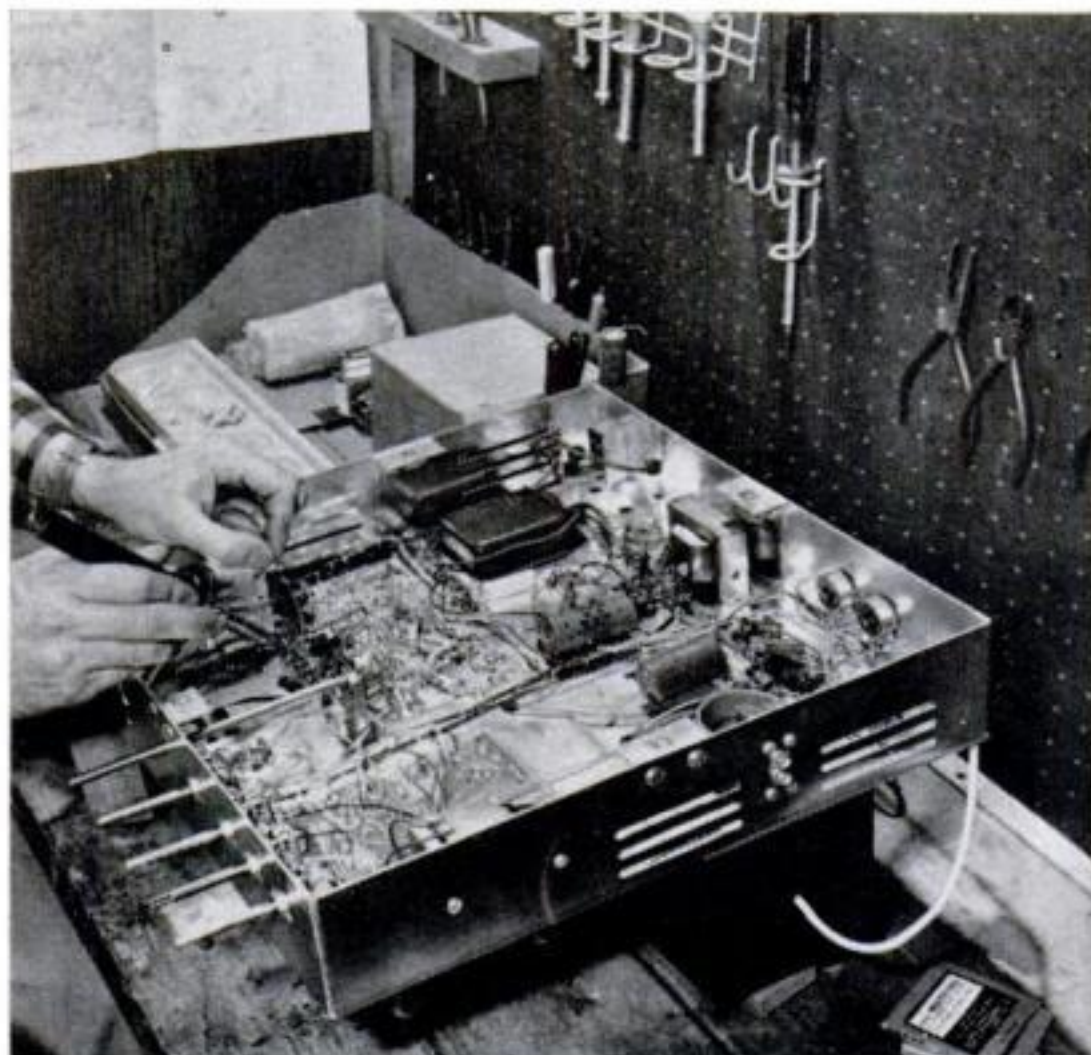
How did they do it? By conscientious application of know-how familiar to any good TV-engineer—no penny-pinching on circuitry, no compromise with performance to get a slimmer box.

The Heathkit 23" Custom TV kit sells by mail order for \$169.95. A wall-mounting mask and panel kit is available for \$25.95, or a furniture-style cabinet for \$89.95.

Two sound outputs are provided: One delivers two watts of clean, low-distortion sound to any external 8-ohm speaker; the other, a special output (cathode follower), plugs into your hi-fi.

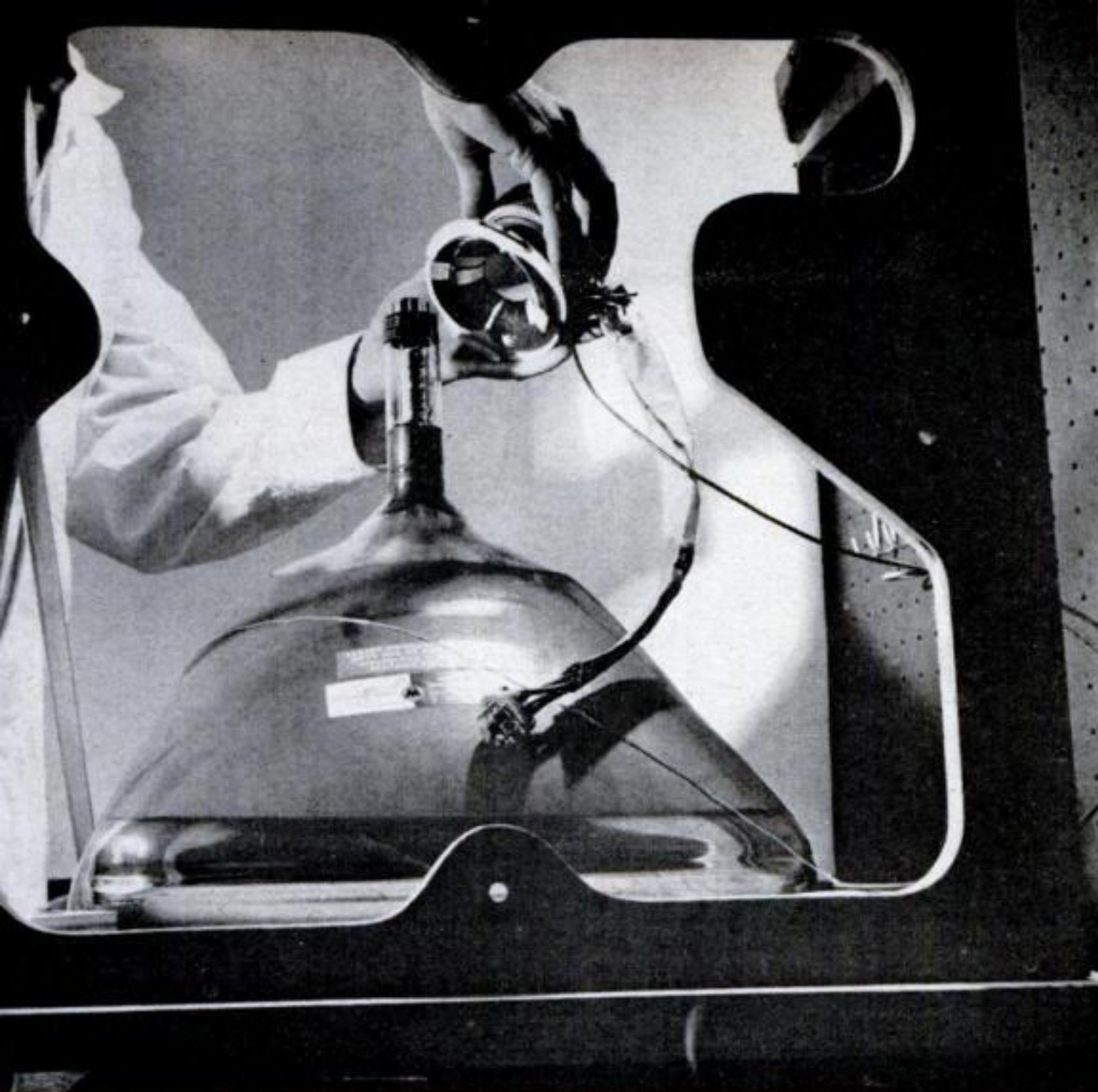


Printed circuit boards save construction time and prevent wiring mistakes. You assemble the one shown here. It contains the sweep circuits and part of the audio amplifier. Two other subassemblies—IF amplifiers and high-voltage section—are factory-wired. All critical circuits are aligned and tested at the factory.



Most of the interconnections between subassemblies are made with two prefab wiring harnesses. You simply solder the proper colored wire to labeled terminals. A few individual resistors and capacitors must be soldered to terminal strips, but the chassis is roomy and wide open—there's plenty of room to work.

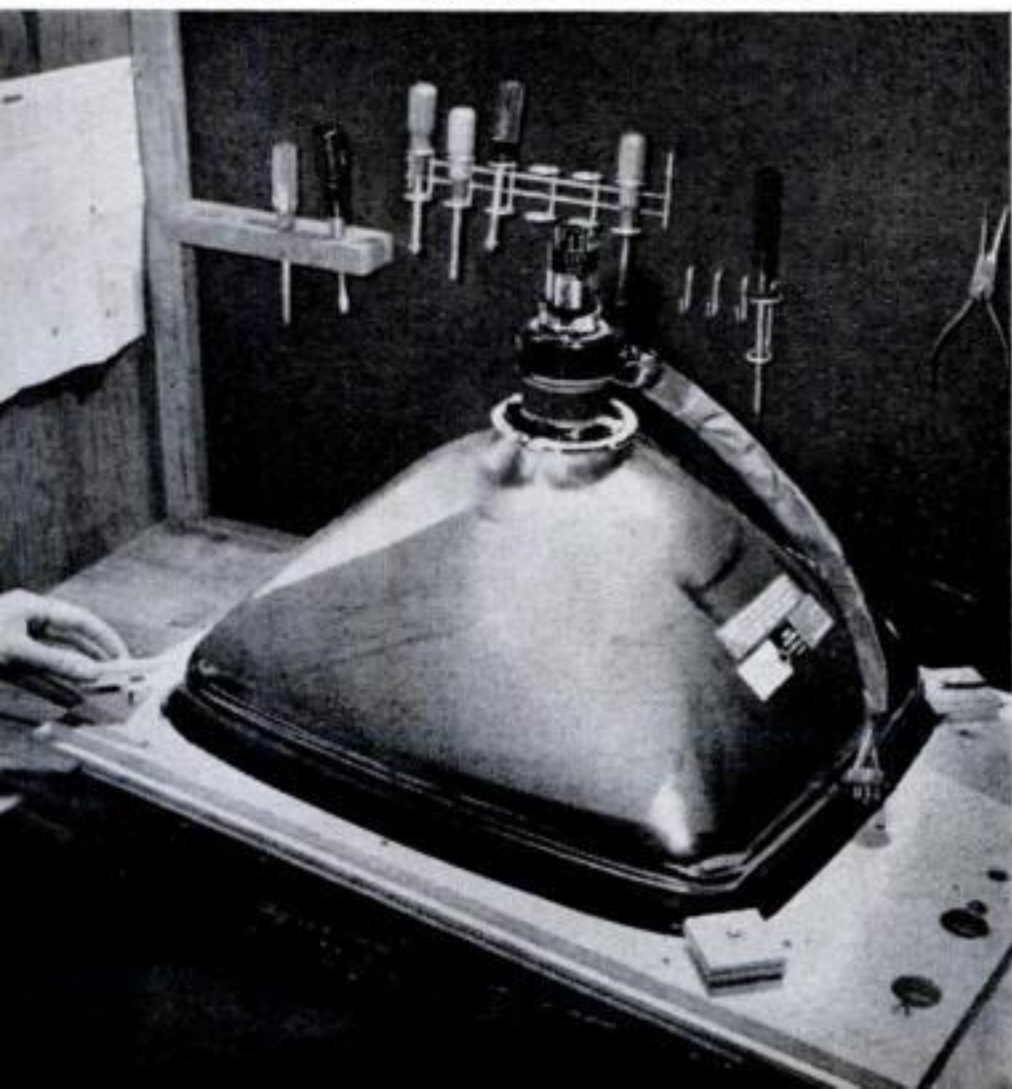
PS ELECTRONICS

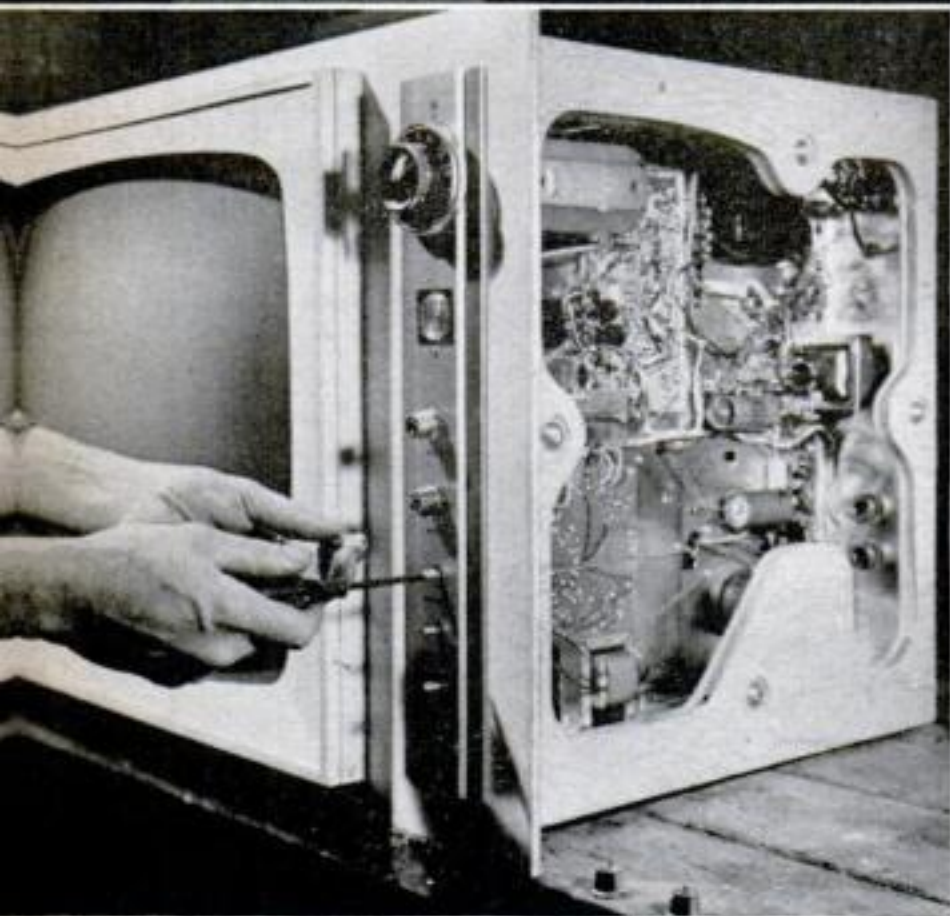
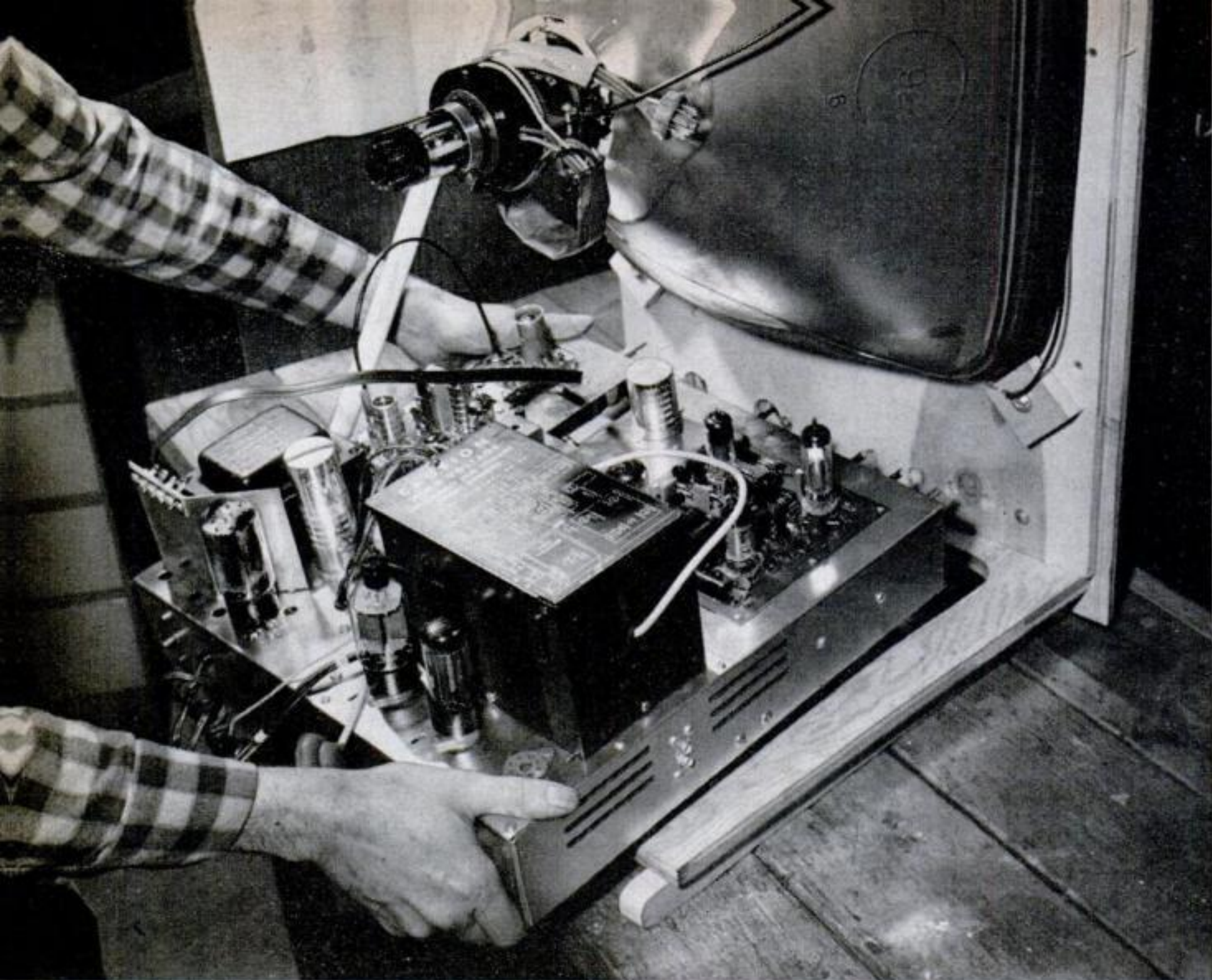


Here the yoke is being placed on the neck of the picture tube. Photo was taken through the opening in the vertical chassis-mounting board—shown attached to the front panel of the wall mount. Separate mounting of the chassis is also possible.

Picture tube is 90-degree-deflection, high-definition type with anti-glare bonded safety glass. Integral molded ears at each corner simplify mounting to front panel. Hardwood mounting blocks supplied with the kit are screwed to the panel to clamp ears. No other mounting brackets or supports are needed.

Picture-tube outer coating is grounded by a bare wire stretched diagonally across the tube; a spring attached to one end holds the wire tightly against the coating. Deflection yoke fits snugly on the bell of the tube and is held in place by a single screw clamp. Leads plug into chassis socket. **CONTINUED**





With picture tube securely mounted, panel is up-ended to install chassis. All control shafts project through holes in the front panel. Chassis is held by four bolts that run through the mounting board into captive nuts on the chassis.

Completed set (left) worked fine. Only adjustment needed was of operating and service controls to get a good picture. Height, linearity, and AGC controls are reached through hollow shafts on the operating controls.

One reason for the superior picture is the complete complement of adjustments provided and detailed instructions for finding the best setting for each. Some adjustments are usually omitted on commercial sets, and a TV repairman seldom takes the time to make the best use of those that are provided. ■ ■

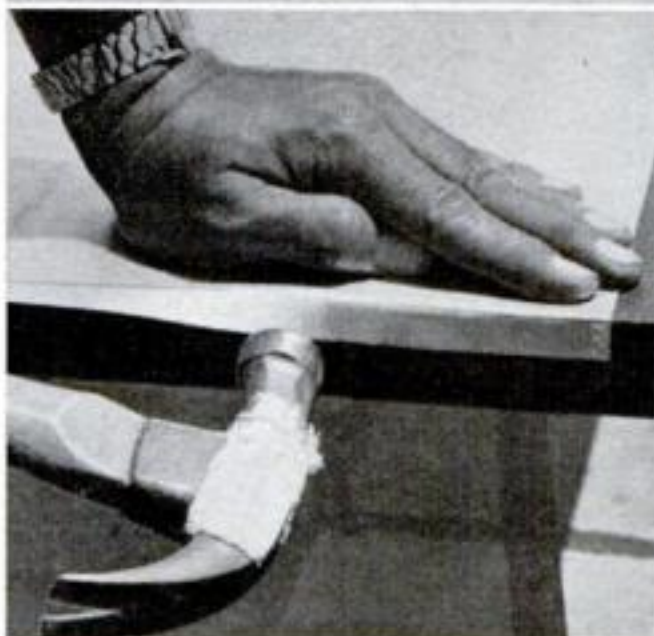
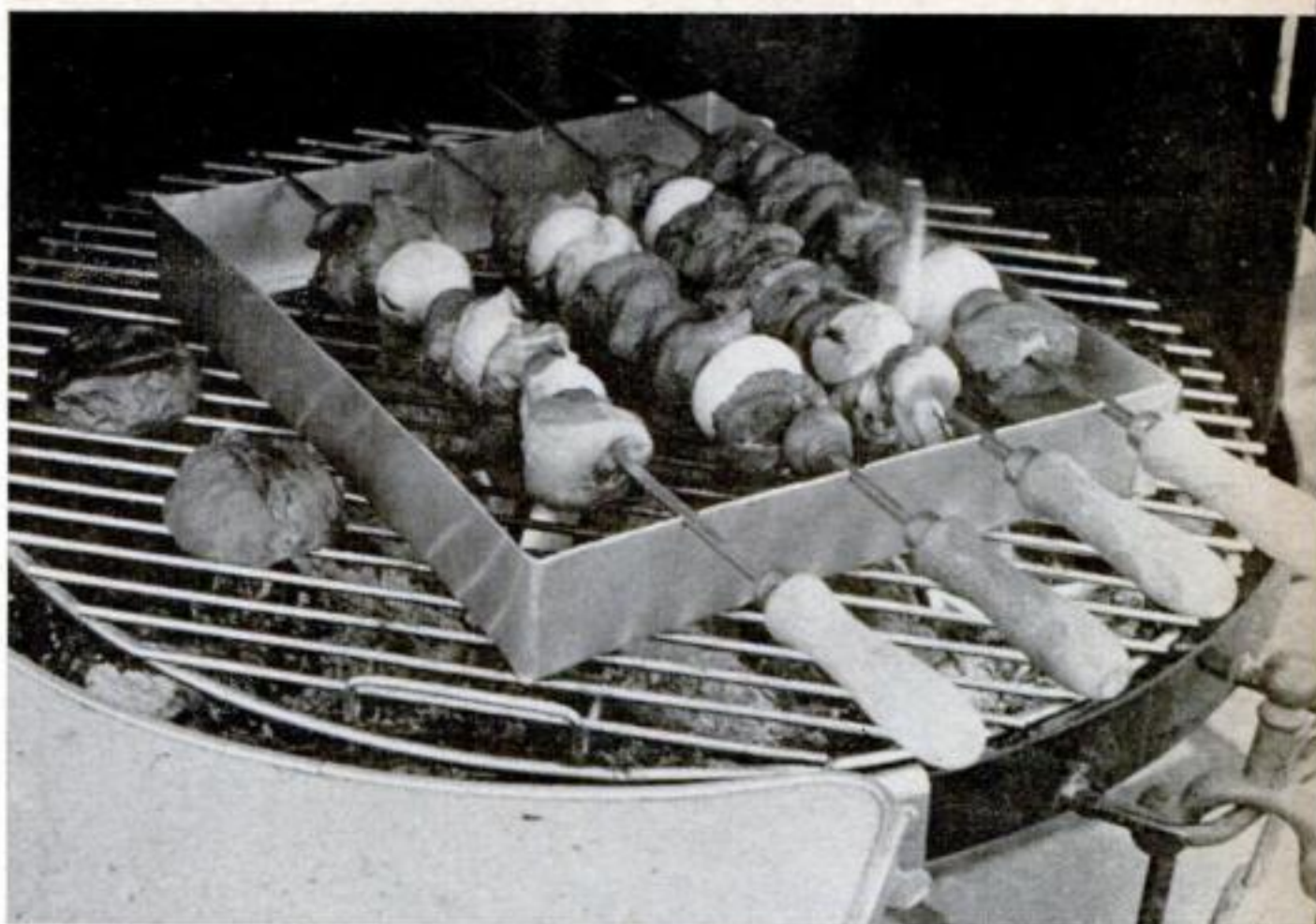


HOW TO BUILD A Kabob Rack for Your Barbecue

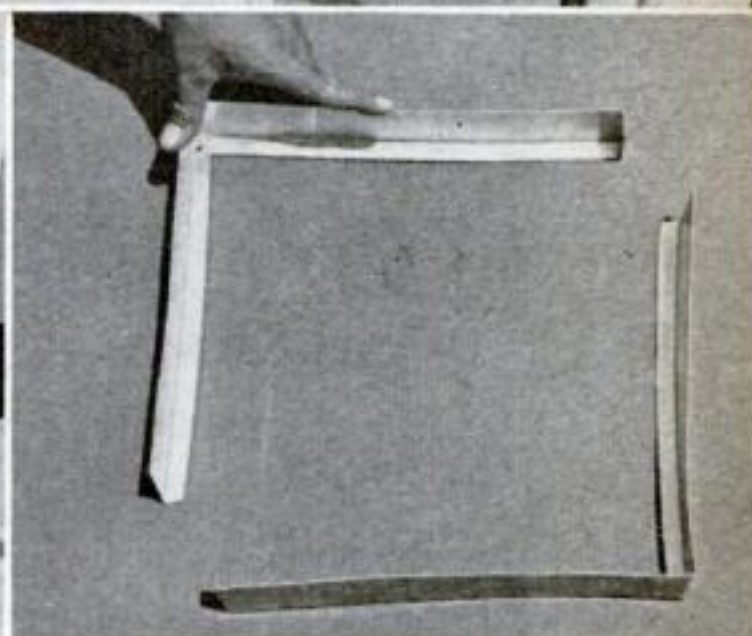
CHARCOAL-broiling shish kabob often results in scorched meat, raw vegetables, and frayed nerves. Prevent this by making a 12"-by-13" aluminum framework, notched to hold four skewers on which the food is spiked. It supports a kabob load the right height from the coals.

Take a piece of scrap aluminum 25½" long and 5" wide. Bend a ½" right-angle lip along each long side. Then cut the strip lengthwise into two equal pieces. Notch a 90-degree angle in each lip, 12" from one end, to make the bend. At one end of each piece, cut a ½" square from the lip. The portion of strip above this can then be lapped over for riveting. File rough edges smooth. Complete the frame by cutting four notches in each 12" leg of the rack.

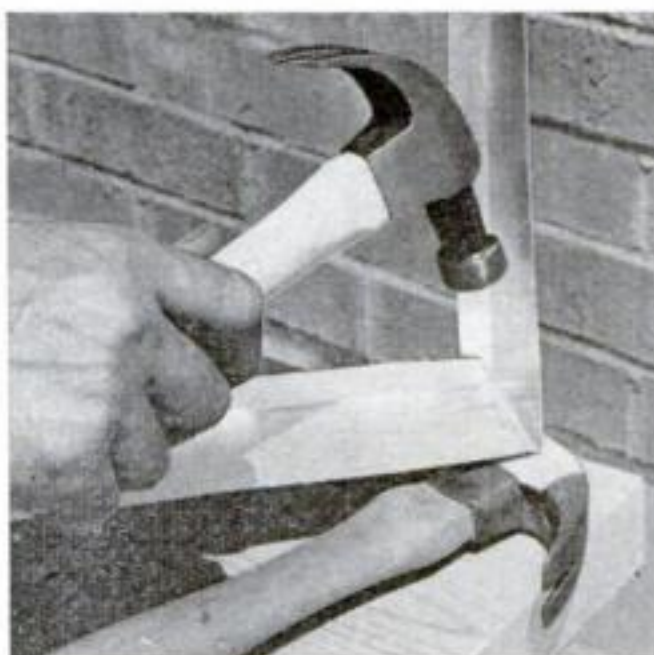
Using square skewers will help to keep the food from sliding around and cooking only on one side.



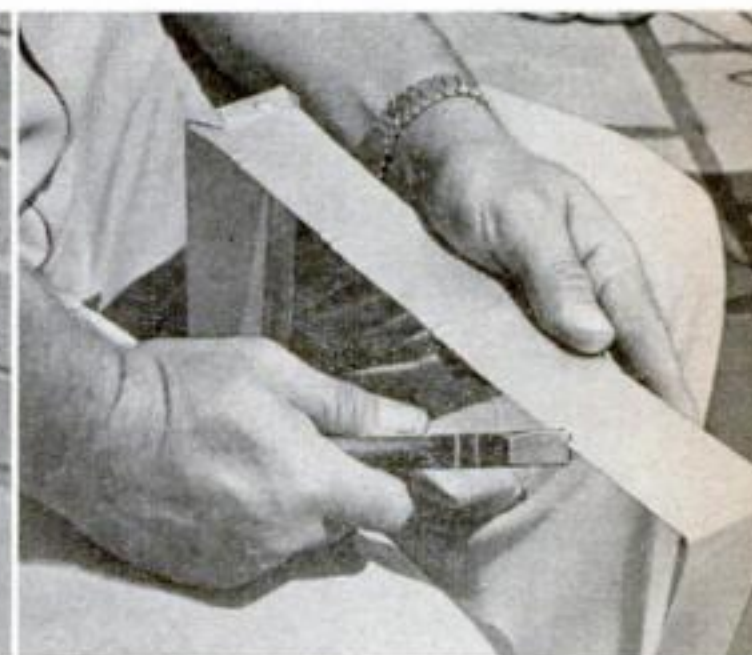
1 Bend a ½" lip along each side of metal strip. Easiest way to do it: Tap strip over edge of bench. Now cut strip lengthwise. Result is two long strips, each with a lip at side.



2 Bend strips at right angle, 12" from end, to produce mating parts. Before bending, make 90-degree V cut in lip of each strip at bending point. Cut ½" square from lip at 13½" end.



3 Drill or punch holes for rivets, making sure bottom edges are flush so rack sits squarely on grill. Rivet the two sections together and peen ends on a flat metal surface.

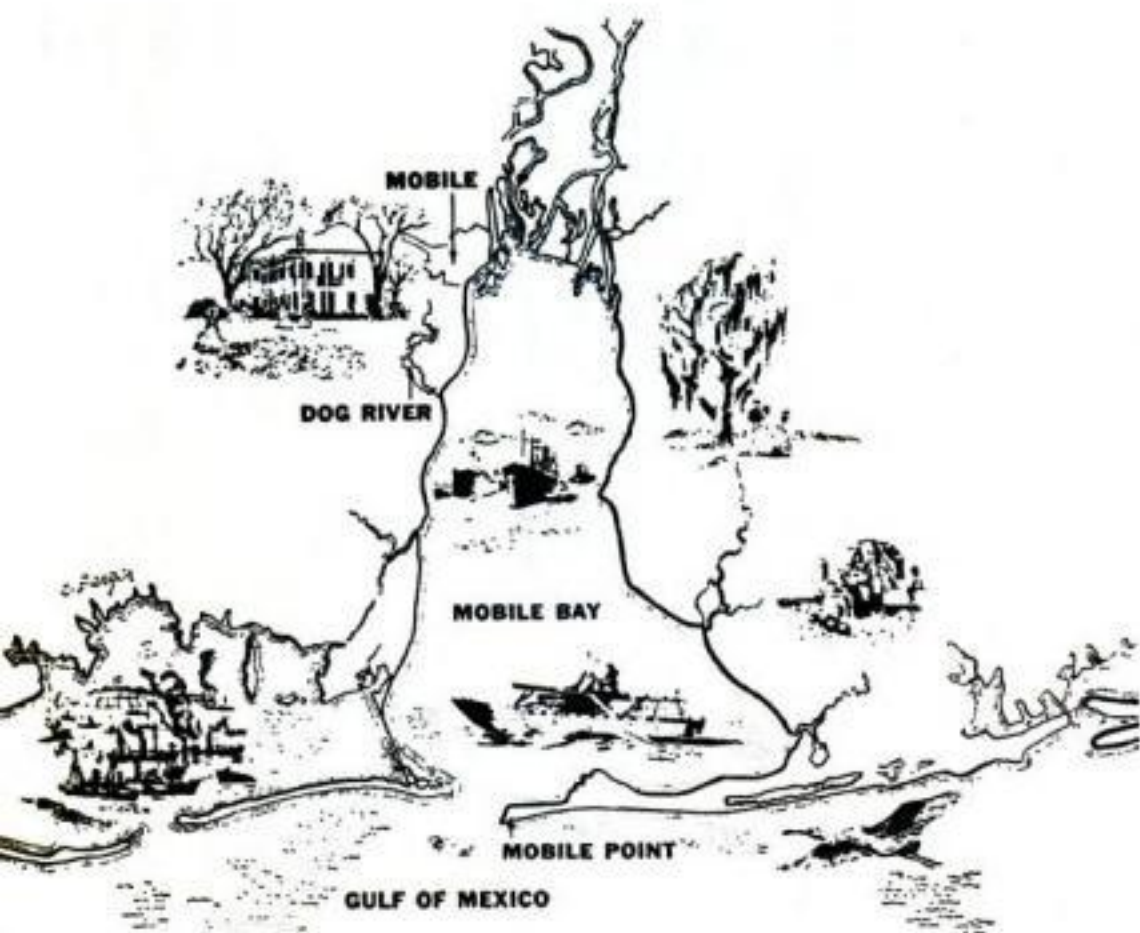


4 Finish by notching four slots on opposite sides of 12" sections. These should be about 2½" apart. Allow 1" clearance for meat at sides. Bend down notched sections with pliers.

Jim Roe Tests the Lone Star Cruise Liner II

By Jim Roe

PHOTOS BY TONY MANUPELLI,
THIGPEN STUDIOS



Mobile Bay was site for this Gulf Coast test. It offers a good combination of interesting, protected rivers, shallow bay waters, islands, Intracoastal Waterway, and open Gulf waters.



MOBILE, ALA.

MOST boat and motor test runs are made under cloudless skies, with conditions just right for boat, motor, skipper, and photographer.

This one wasn't that way.

When we cleared Dog River light into Mobile Bay, we were in the middle of a good, honest January rainstorm. Parkas were the order of the

The power: Two brand-new Johnson 75-hp. Electramatics. Each was equipped with an alternator, located beneath my left hand. They gave us speeds that topped 35 m.p.h.





day. New Orleans airport FAA radio promised nothing but more of the same, with an interesting frontal pattern to boot.

But no matter. One of the things I like to pass along to POPULAR SCIENCE boatman-readers is just how boats and equipment operate when conditions are not ideal.

We were anxious to get at the job, for this was an interesting combination. The

This is shrimp-boat country. Small, sturdy craft like the one at right ply these Gulf waters for shrimp and oysters. When the catch is good, they return to port with gunwales awash.

boat: Lone Star's new Cruise Liner II, a 24-foot aluminum lapstrake outboard cruiser. The motors: twin 75-hp. alternator-equipped Johnson Electramatics.

We chose the boat for a very special reason. Most boats, when offered for sale, resemble shell houses. Any finishing is up to the boatman himself—both to build the conveniences in, and even to design them. This slows a fellow down. The result, too often, is that he either doesn't get the boat at all because he doesn't see how well it *could* be outfitted, or he does buy it and gets tired of

CONTINUED

What we're testing

The boat: Lone Star's Cruise Liner II

Specifications: Length—24 feet.
Beam—96 inches.
Weight—1,450 pounds.
Capacity—3,218 pounds.
Max. hp. rating—150.

Price: \$2,795.

Motors: Johnson 75-hp., alternator-equipped Electramatics. Price: \$1,065 each.

Rigged by: McLeod Marine, Mobile, Ala.



"boating" before he ever leaves the dock.

Now, however, a small but growing number of look-ahead manufacturers are designing and building into their boats a great number of conveniences right at the factory. Lone Star's Cruise Liner II, when we first saw her at the Chicago trade show, seemed an outstanding example of this new breed of boat that's ready to use when you buy it.

Just take a look, as we head for the middle reach of the Mobile Ship Channel, at what those folks down in Dallas, Tex., have designed and built into this 24-foot hull.

One of the most obvious new features—and one of the most useful—is a big walk-through bow hatch. To open it, you release the center section of the cabin windshield, lower it, and slide it forward, far up under the bow deck. Then a big hatch section of the bow deck slides forward too. The result is that you can literally walk, not crawl, right from cabin to bow.

Standing room. After you've thoroughly examined this new hatch, you'll discover that all of this time you've been *standing up* inside the cabin of a 24-foot outboard cruiser. This, too, is different. The 70-inch headroom allows all but six-footers to stand up straight.

So, what else is new?

Several things. Among them, the ingenious method of slinging roll-up top bunks. These are made of stout fabric attached to the gunwale side of the cabin over each regular lower bunk, with a tubular aluminum support rod sewn into the inboard side. When not in use, these simply roll up on the rod and rest unobtrusively in the stowage compartments on each side of the cabin. To use them and transform the boat into a four-sleeper, you simply unroll them toward the center of the cabin and hook the tubular rod into handy supports.

Lone Star engineers have made every inch count. A good example is the marine head, always a vexing problem in an outboard cruiser. If you install a fully enclosed head, it takes a big chunk of the cabin area.

Heavy-weather test proves value



It was raining as we left the dock, and New Orleans FAA radio promised more. For safety, we kept track of upcoming weather on the Zenith Royal Navigator, through earphones. Special dash panel carries test controls.



Lots of storage room: Here fire extinguisher and fishing gear stow handily in shelves. There's other storage under bunks, in bow, under pilot platform, and under motor well. Total storage in the boat adds up to some 50 cubic feet.

So here's a slick way of eating your cake and having it, too. A marine head is installed just forward of the cabin bulkhead on the starboard side. A permanent bulkhead separates it from the rest of the cabin, *up to about work-table height*, where it is hinged. It folds toward the stern and rests, horizontally, against the rear cabin bulkhead. In this position it completely conceals the head and leaves the cabin area looking large and uncluttered.

When you wish to use the head, all you do is swing this hinged bulkhead to

of Cruise Liner II's many built-in features



Running lights on Cruise Liner II are built into hull itself. Hull is lapstrake design, formed of corrosion-resistant aluminum on a large forming press.



Telescoping winch lets you adjust height for best angle of pull. Launching and recovery were easy, even by hand. A power winch would help.



Walk-through bow hatch proves its worth as we approach dock. Here Earl Glenn heaves line while standing securely in the boat—a valuable safety feature.



Well-designed galley has stove that swings out with cabin bulkhead. Icebox, water jug stow below, dishes above. Head-room allows stand-up cooking.



Enclosed head is separated from cabin by swing-out bulkhead that folds horizontal for more room. Curtain hides head or swings to form dressing room.



Cabin sleeps four. Top bunks roll up into shelves when not in use. To rig, you hook aluminum rails in brackets. This makes craft a fine family boat.

a vertical position. A sliding curtain acts as a door.

Equipment plus. The Cruise Liner II also comes equipped with a swing-out, fully equipped galley. This is attached to the port-cabin bulkhead. Unlatch this bulkhead and swing it toward the stern, and you're in business. A marine two-burner alcohol stove is attached to the bulkhead itself, and has a small work space in front of it. It swings out from under a plastic-topped workbench inside the cabin area, so you produce a stove and two work spaces just by swing-

ing the bulkhead. Beneath the inner work space is an ice refrigerator. Beside it is storage space for a 2½-gallon plastic water jug, a big plastic dishpan, and a set of plastic tray-plates. Plastic cups and tumblers are stored above the work area. All are standard equipment.

This boat even has a private dressing room. Swinging curtains at the rear of the cabin fit into handy brackets to form a completely enclosed space for dressing. There's also a mirror—standard equipment, of course.

Besides all these ingenious built-ins,

the cabin has two ready-installed storage racks running the length of the bunks, and storage under the bunks themselves—for a total of 50 cubic feet of storage space. All the windshields are safety glass, and the cabin roof and cockpit are foam-lined. This helps deaden noise and provides flotation. In fact, the Cruise Liner II has enough punctureproof foam flotation to support more than its OBC (Outboard Boating Club) rated capacity.

There is no brightwork on the Cruise Liner II. Textured vinyl serves as trim along the cabin overhead line and for the bulkhead coverings. Cabin and cockpit floors are covered with vinyl. As a result, the craft needs little or no maintenance or polishing. A mop and a bucket of water keep her shining.

In the cockpit. The boat comes complete with mechanical steering, pilot seat and platform, and running lights wired to switches. The motor well is watertight, and has a plastic-fabric curtain that fits snugly to the cockpit floor, covering up the usual clutter of wires, batteries, gas lines, and other whatnottery.

Lifting rings are affixed to the deck and to the transom. Aluminum construction makes the boat light enough for its size so that most outboard hoists can handle it without slings.

This same weight advantage makes the boat equally easy to launch from and recover on a trailer. We trailed it to the water on Lone Star's specially designed trailer, and it took only moments to put it in and get it back out of the water. Even with a hand winch, recovery was not difficult. A power winch would have made it a cinch.

Trailing this boat, even though it's 24 feet long, is easy. Its beam width is just 96 inches, which quiets the fears of patrolmen and tollgate attendants. Though the boat weighs but 1,450 pounds, it's OBC-rated to carry 3,218 pounds, including, of course, engines, fuel, gear, and passengers. Maximum horsepower rating is 150.

And 150 horses are what we based our test on. Although the two Johnson V-75 Electramatics were brand-new and not run in, they were "in all respects ready for

[\[Continued on page 184\]](#)

Here's how Lone Star builds Cruise Liner II for safety and long life

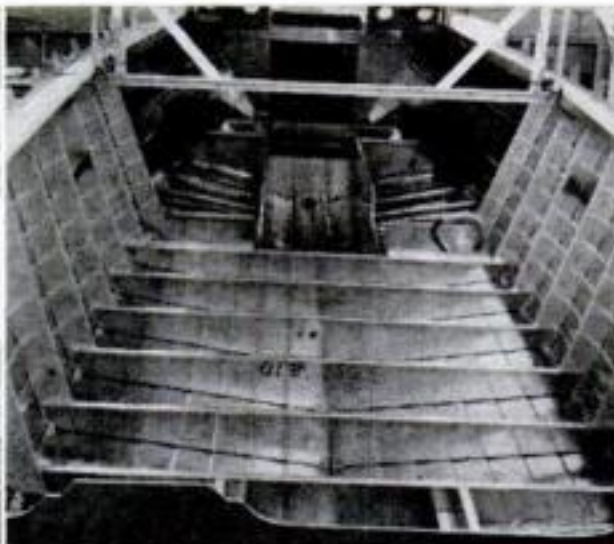
For all normal conditions, this boat is a rugged, well-put-together craft. As a matter of fact, it's so well put together that its makers back it with a guarantee that says, among other things: "Lone Star aluminum boats in noncommercial usage are warranted for the *life of the original owner* against

skin punctures and popped rivets. . . ."

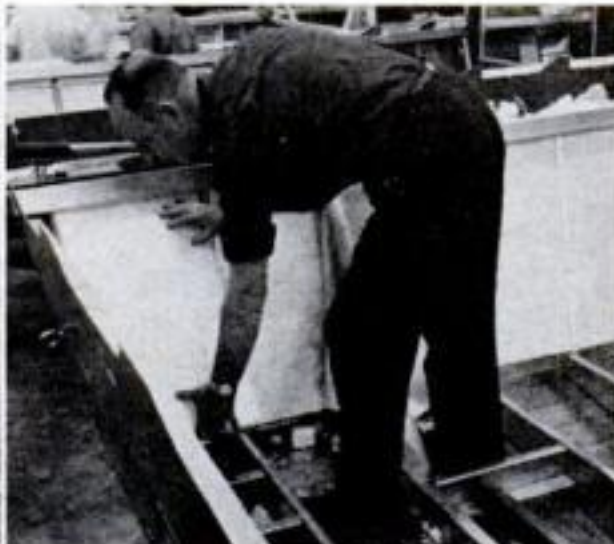
That's quite a promise. The manufacturer's guarantee also includes one-year warranties against defects in workmanship or materials and against trailer damage if the boat is hauled on a properly fitted, specified Lone Star trailer.



Bulkheads and hull plates are assembled on a master jig to insure accurate hull configuration. Strakes add stiffness.



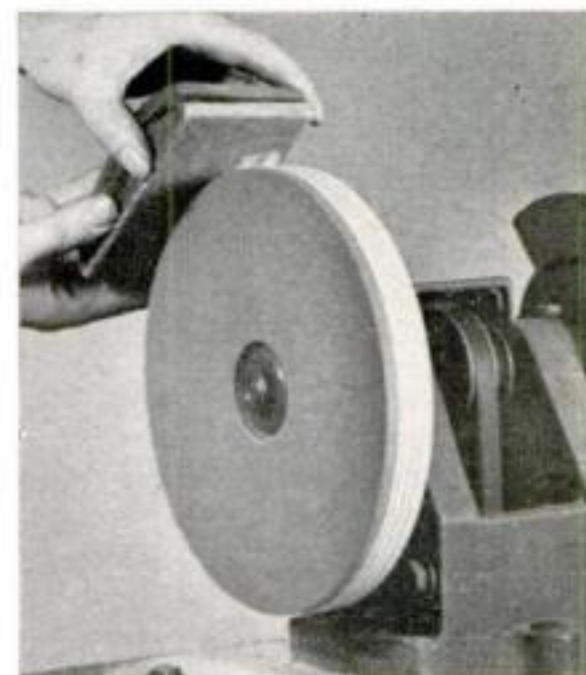
Close-spaced bulkheads, formed on 1,000-ton press, give the hull high strength. Aluminum keeps boat light.



Styrofoam blocks, inserted between bulkheads and in cabin roof, provide flotation, noise damping, and insulation.



Make the hone from $\frac{1}{4}$ " tempered hardboard, glued screen-side-out to $\frac{3}{4}$ " plywood. Before gluing, saw the center hole in the hardboard large enough to countersink the arbor flange.



Mount the hone on a high-speed spindle—grinder, lathe, drill press, or circular saw. Sand edge smooth. Make sure the hole in the center is square with the disk's face.

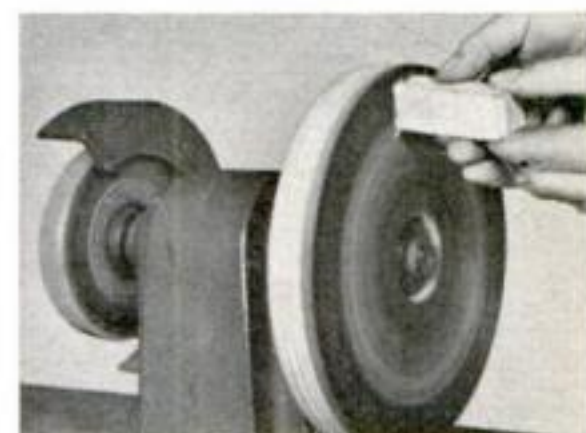
Lap-Honing Makes Edges Supersharpen

PS SHOP

HERE'S an idea borrowed from diamond cutters, who use flat laps charged with fine abrasive to facet gemstones. Rig a hard-faced disk on a high-speed spindle, charge it with buffing compound—and you'll have a lap-hone that, after you've finished conventional sharpening, will put an extraordinary final polish on a chisel, lathe tool, or other beveled blade.

The lap shown is simply an 8"-diameter disk cut from scrap $\frac{3}{4}$ "-plywood faced with $\frac{1}{4}$ " tempered hardboard, glued on screen-side-out. The patterned screen indentations will load and hold buffing compound. White rouge works best.

When the disk is mounted on any fairly high-speed power-tool spindle, it will quickly polish a flat tool bevel and superfinish the tool's cutting edge. For best results when honing a beveled blade, hold the cutting edge against the disk so that the hone revolves across the bevel. Always angle the edge in the direction of the disk's rotation to keep the tool from slicing into and scoring the hardboard.



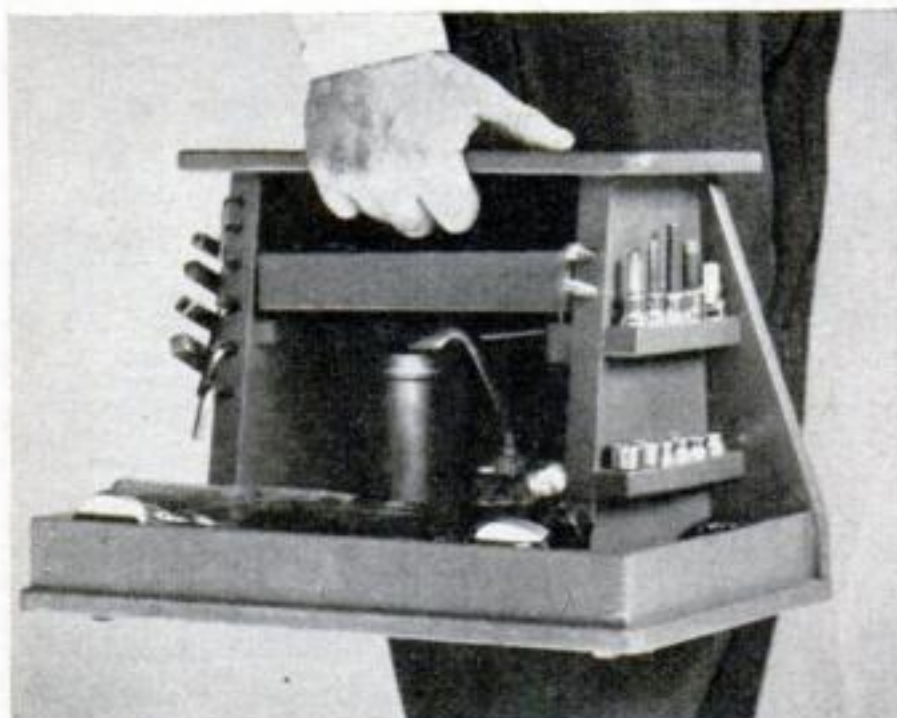
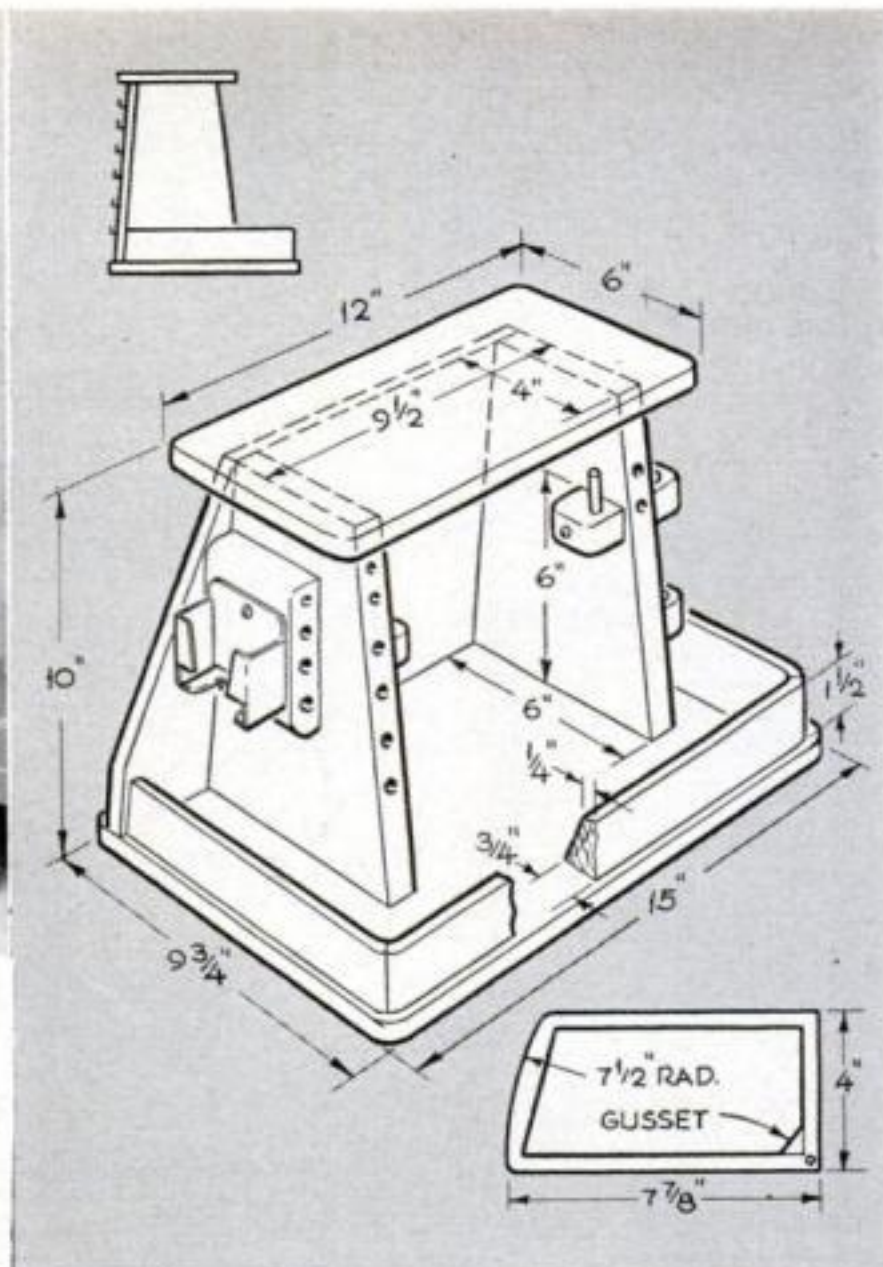
To charge the wheel for buffing, hold a stick of white rouge, or other buffing compound, lightly against the face of the revolving disk. Waffle texture of the hardboard holds the compound.

Jeweler's eye loupe is a great help for disk-honing edged tools. An inexpensive loupe that magnifies three or four diameters lets you see exactly what results you're getting.

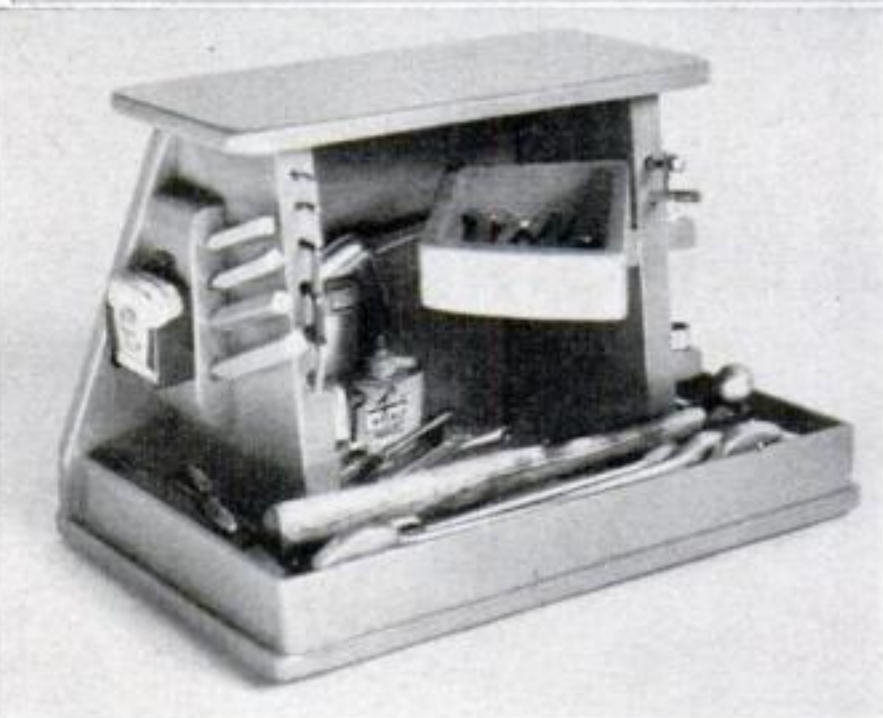




You can sit on this tool stool for low jobs like repairing a power mower. For the stool shown, $\frac{1}{2}$ " plywood was used for the base, seat, and back; $\frac{3}{4}$ " pine for the two vertical supports. Tapered side rails were ripped from $\frac{3}{4}$ "-by- $1\frac{1}{2}$ " pine. All corners are sanded round.



A swing-out tray stays inside when you carry the stool. It has a $\frac{1}{8}$ "-hardboard bottom. The sides and one end are $\frac{3}{8}$ "-by- $\frac{1}{8}$ " pine; the curved



end was made from $\frac{3}{4}$ " pine, cut to a $7\frac{1}{2}$ " radius after assembly. The hinge pin, a 2" length of $\frac{3}{16}$ " steel rod, fits snugly in its block.

A Tool Holder That Takes You off Your Feet

THIS handy tool carrier also serves as a seat when you do those low jobs that normally cramp the legs. The one I made has space for about 50 commonly used tools and wrenches, enough for just about any home repair.

The tool holders can be custom-fitted to your own tools. I drilled wood blocks to fit my punches and sockets, and glued and nailed the blocks to the carrier sides.

A measuring tape rides in a plastic holder tacked to the punch block. Hooks made from nails were placed on the back for box-end wrenches. Holes drilled in the edges of the vertical supports take set-screw wrenches.

I put two coats of enamel on the completed carrier and tacked thin rubber pads under the corners of the base.—Arthur J. Garinger, Dallas, Pa.

PS PROJECTS

HOW TO CUSTOM-BUILD A

Carrying Case

Need a case to hold your camera outfit, lab equipment, or other hardware? Here's a beauty

By John Burroughs

BUILDING a fitted case is easy shop-work once you've planned the job. It's deciding how that's tricky.

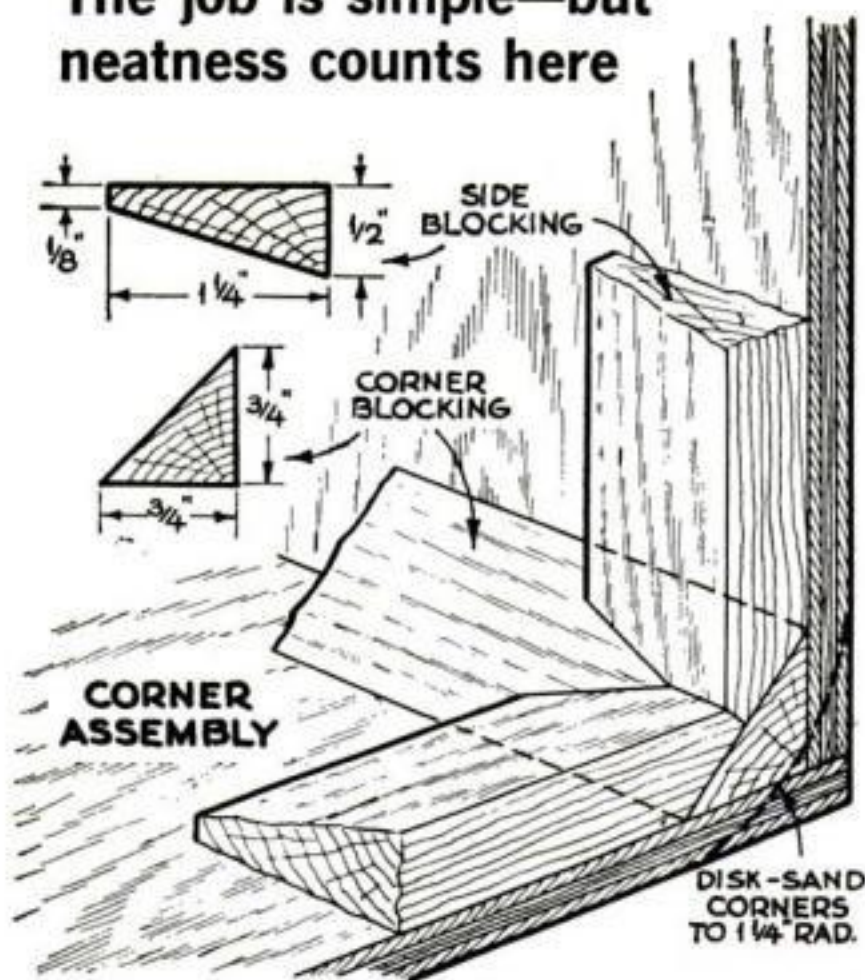
There are three decisions: what materials to use for the body, what sort of molding to

CONTINUED

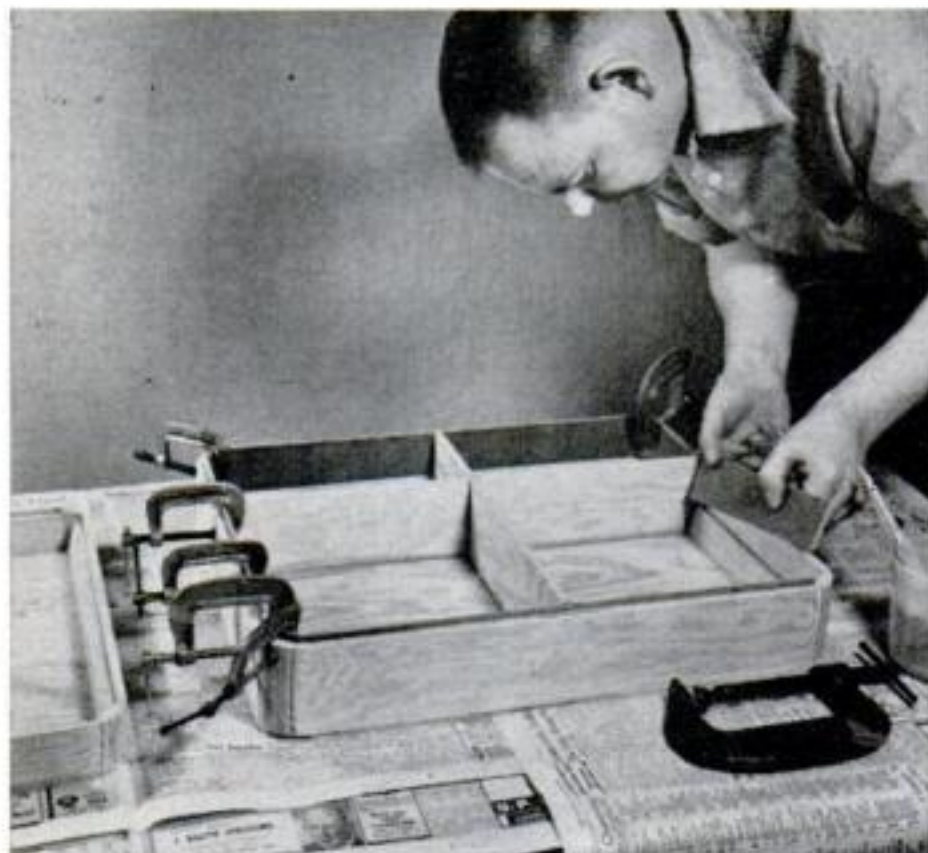


There's a place for everything in this fitted case, and everything fits just right. The author's measures 15" by 19" by 5". For best arrangement, lay out all your gear first on a piece of paper to determine the dimensions of your own case.

The job is simple—but neatness counts here



Reinforce corner joints with glued-in triangular and wedge-shaped strips, tacking them into place. Then glue the plywood panel on top of the case to make it a fully enclosed box.



After fitting all the partitions, glue (and clamp) $\frac{1}{8}$ " hardboard strips to the inner sides of the case's lower section walls. These will form a sealing lip along the line of closure.

use, and how to cover the finished box.

For some time I'd wanted a compartmented case to hold two $2\frac{1}{2}$ -by- $2\frac{1}{4}$ cameras and plenty of accessories—a case reasonably good-looking, yet sturdy enough to give my equipment adequate protection. But the camera cases I found weren't suitably divided, and prices were way out. I thought about installing partitions in a regular suitcase, but the inexpensive overnight cases I looked at seemed too flimsy. I decided to build a case from scratch.

What to make it of? I considered fiber-

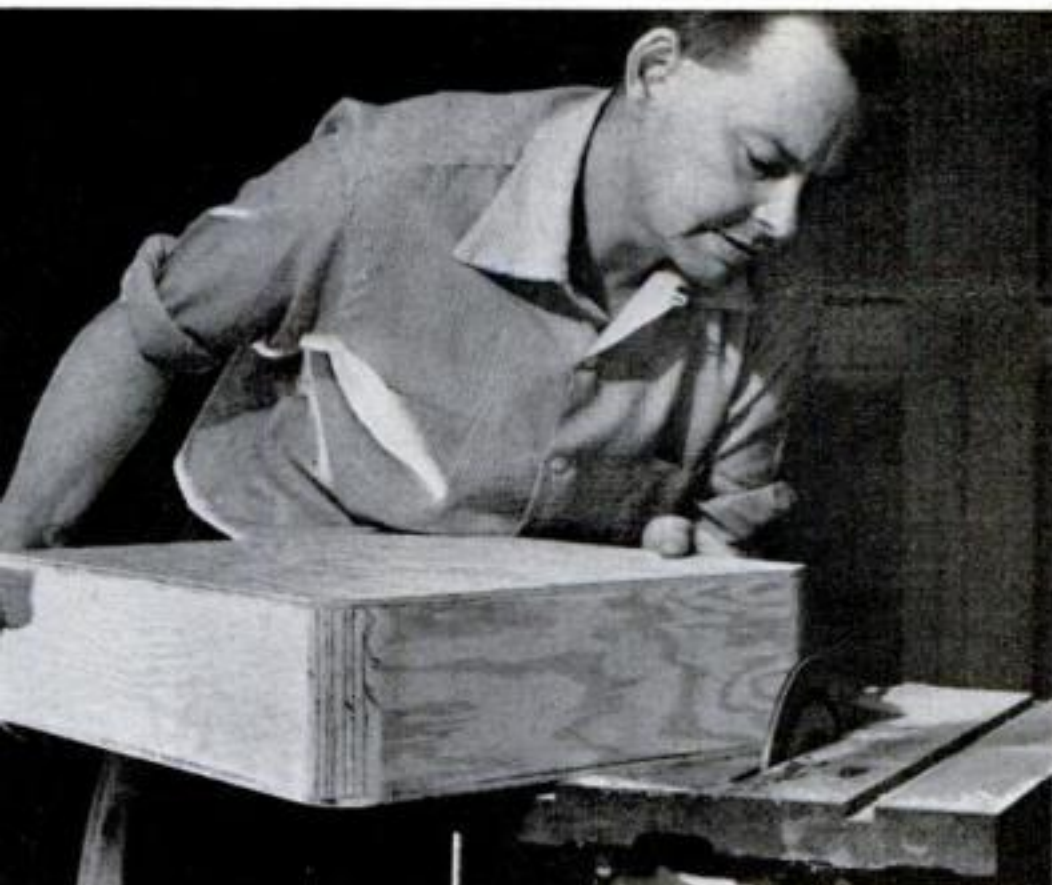


Sand all outside surfaces smooth before covering the case. To make sure there are no sharp corners to cut into the fabric covering, bullnose all edges with a sanding block.

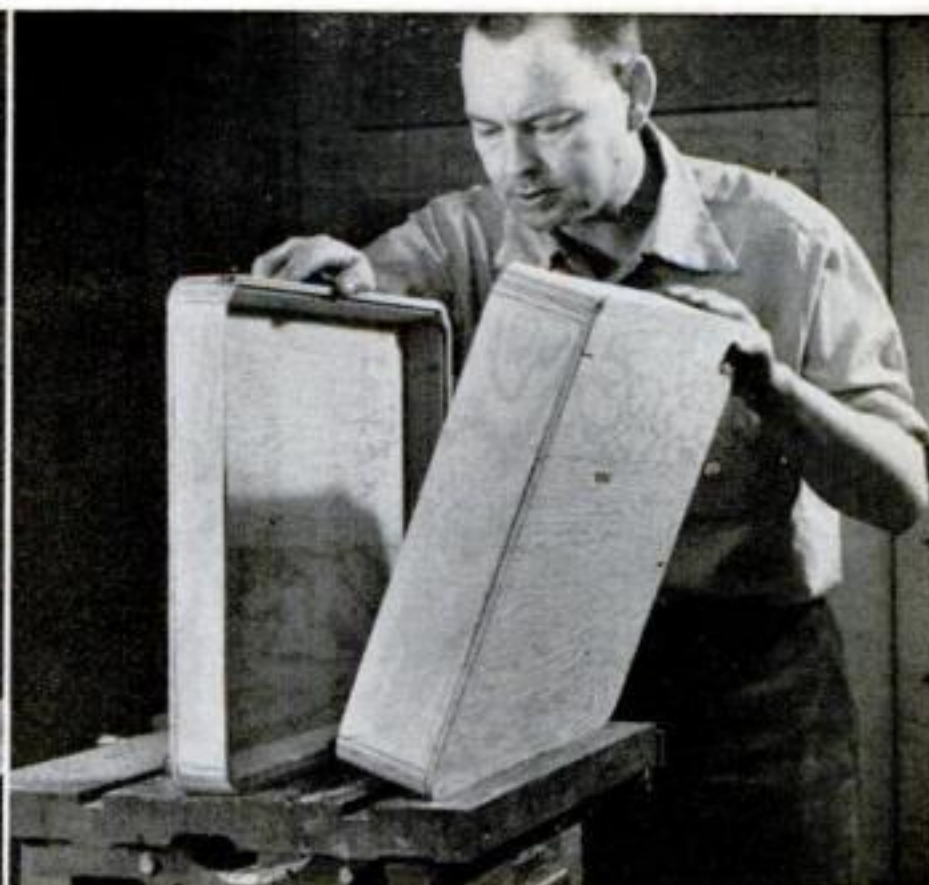
glass, but since making molds would involve too much work, I chucked the idea. I also considered resin-laminated, bent-veneer side walls. And there were a half-dozen other possibilities.

I settled for wood and very simple construction—a plywood box with blocked joints. I could build a wooden case solid, I reasoned, and cut it apart.

After figuring inside dimensions that allowed for cushioning, I glued up the box from $\frac{1}{4}$ " plywood, reinforcing the joints with wood strips—short triangular strips in



Round off the corners of the case to a $1\frac{1}{4}$ " radius. The easiest way to do this: Use your bench-saw sanding plate or a disk sander that's faced with a coarse-grit sanding paper.



Now cut the case apart on your table saw with a sharp, thin-gauge saw blade. This is a ticklish job: Make the cut slowly and carefully to avoid splintering the plywood edges.



Cover the top and bottom of the case with a fabric-backed vinyl upholstery material. Contact-cement the covering, pulling the edges down smoothly and tacking them, as above.

the corners and mitered wedge-sectioned strips along the walls—before gluing on the top. After assembling it, I rounded the four corners on a sanding disk and sliced off the lid on a table saw. Then I installed main partitions in the body and glued strips of hardboard along the walls to form a lipped seat for the lid.

Most commercially built cases are trimmed with metal or plastic moldings to hide seams in the covering. I found my trim in ordinary aluminum cap molding—the kind with a .070 slot sold for edging $\frac{1}{16}$ "



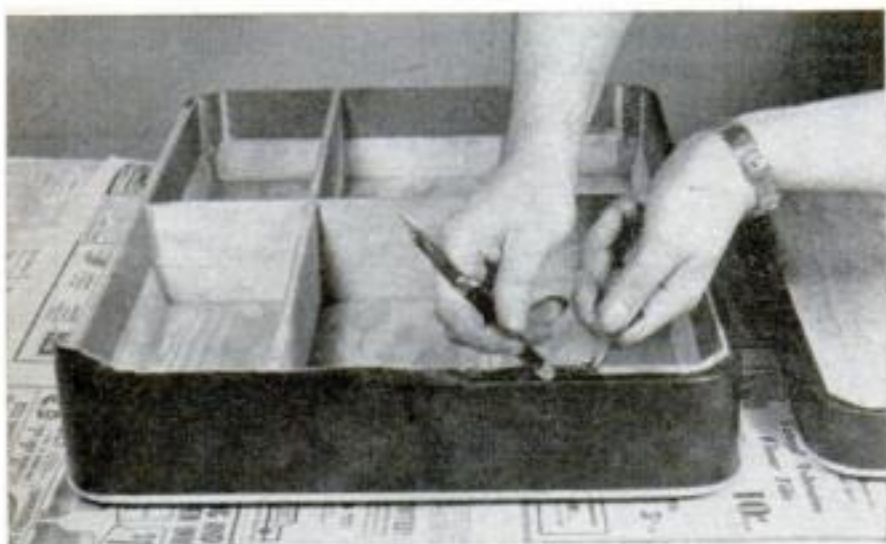
Aluminum cap molding hides the tacks that secure the top and bottom coverings. Screw the molding in place in the rabbets around the case. Fill the screwheads flush with cold solder.

plastic laminate. I could cover the case top and bottom, then screw the molding over the edges of this covering, finally slip the covering into the slot in the molding.

This scheme, however, involved cutting shallow rabbets around the box and setting the molding flush. To know how deep to cut the rabbets, I had to decide what material I'd use for covering the case.

Thin leather might scuff, I thought, and I might have trouble pulling heavy leather over the edges of the case smoothly. The cheap artificial leathers I found wouldn't do.

Finishing touches produce a handsome case



Side covering is brushed with cement and slipped into the cap molding. Turn the vinyl material over the edge along the closure line, and trim so that it butts against hardboard lip.



Hinge the case lid to the body with a length of nickel-coated 1½"-wide piano hinge, inseting the hinge into the covering. Check to make sure that the lid closes squarely.

But in an upholsterer's shop I spotted some of the new expanded-vinyl upholstery materials used for covering deep-spring furniture: beautifully stretchy, knit-cotton-backed, $\frac{1}{16}$ "-thick, 54"-wide, \$5-a-yard materials that looked more like leather than leather. I bought one running yard, charcoal gray.

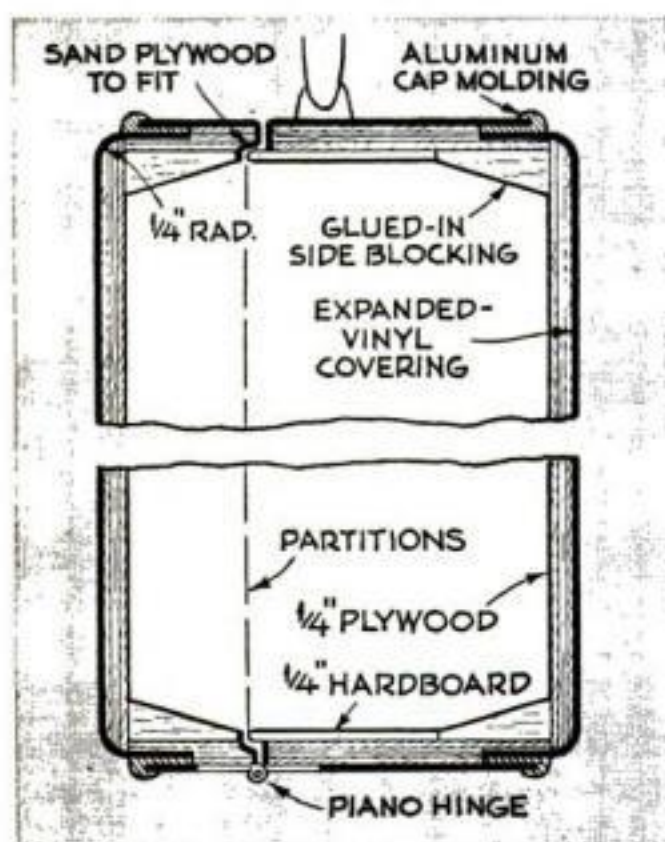
After cutting $\frac{1}{8}$ "-deep rabbets around the box, I bullnosed all the edges of the case with a sanding block. Then I contact-cemented squares of vinyl on top and bottom, pulling the edges over the bullnosed corners and tacking the material along the rabbets. I screwed aluminum molding in place over the tacks and filled the screw-heads with cold solder.

Next I cut a long strip of vinyl to cover the side walls, brushed the material generously with contact cement, and, with the cement still wet, slipped the covering into the molding groove. I trimmed this covering to butt against the hardboard lip.

Before covering the sides of the lid, I sanded a bevel around the inner edge to allow for the thickness of the vinyl. Then I pulled the covering under the edge, trimmed it to butt against the lid's wedge-sectioned strips. The lid fit perfectly.

To hinge it to the body, I used nickel-coated piano hinges. I fitted on a handle, catch, and half-round metal feet.

Covering chunks of $\frac{1}{8}$ " sponge rubber with leftover vinyl, I made resilient, matching pads for the camera compartments. And I used vinyl-covered $\frac{1}{8}$ " hardboard for additional dividers. After rubbing cemented edges with black cement, I painted the interior flat black and cemented pads on the lid to grip the cameras. ■ ■



Fit dividers as needed into finished case (shown in cutaway, left) and nest your cameras and gadgets in their compartments, using vinyl-covered $\frac{1}{8}$ " sponge-rubber padding. Add carrying handle and necessary latching hardware.





Bolt extends reach of Allen wrench

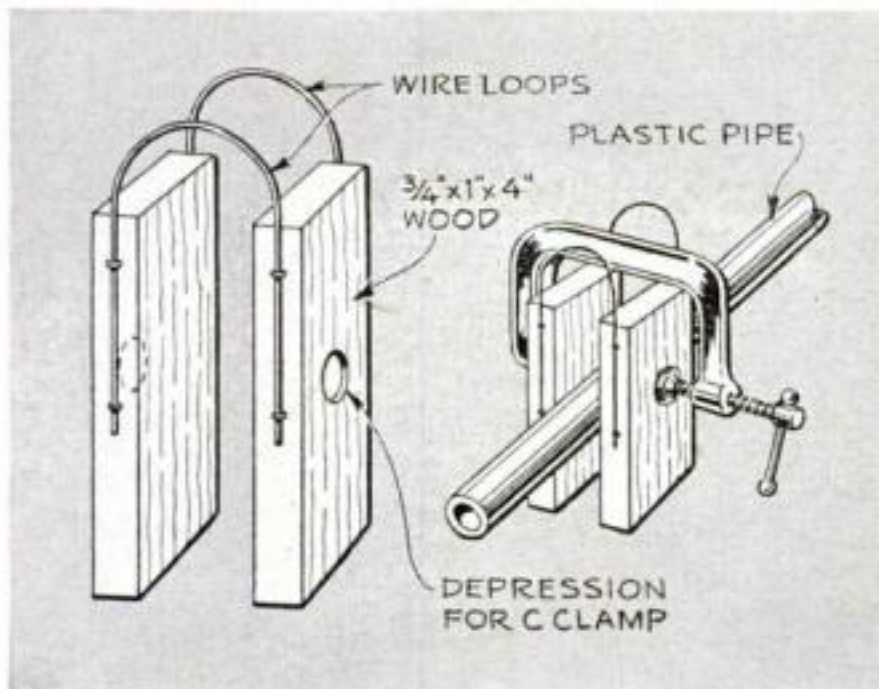
Socket-head capscrews, often called Allen screws, are sometimes difficult to break loose—or tighten—in hard-to-reach spots. The problem can be solved by drilling a good-sized hole so the short side of the wrench fits snugly in the hole. I found this helpful in removing a large number of the socket-head capscrews from the oil-pan flange of a foreign car.—*E. F. Lindsley, East Troy, Wis.*



▶▶▶After trying many methods for removing the bubbles that appear when varnishing furniture, I hit upon this simple procedure:

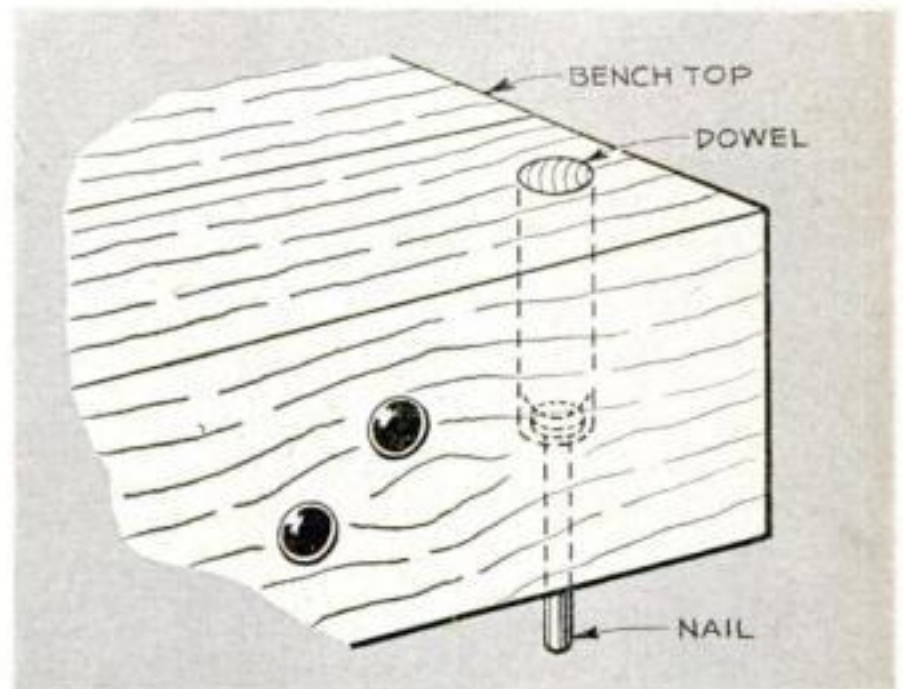
Spread the varnish over the surface and brush it out lightly. In a few minutes wipe

off the excess with a cloth soaked in the varnish. (Use a lint-free cloth or you'll have another problem on your hands.) If this is done properly the varnish will remain on the surface, but the bubbles will disappear.—*Archibald Black, Stafford Springs, Conn.*



Clamp shuts off plastic water pipe

In working on a country-home water pump it's convenient not to lose the prime. I do this by using the clamp above on the plastic pipe that delivers water from the well. Holes drilled part way through the wood blocks keep the C clamp from slipping. Before you compress the pipe, soften a section of it with hot water. This lessens the chances of splitting the pipe.—*R. B. L. Snow, Muskoka, Canada.*



Snug spot for a workbench dowel

Many workbenches have the front edge drilled for a dowel, which supports the far end of long boards held in the vise. But the dowel is in the way when not in use. To remove it—and still keep it handy—drill a dowel-size hole in the bench edge. Drill a smaller hole at the bottom and drop in a nail. A push up on the point of the nail pops up the dowel.—*Carole Knutson, Bismarck, N.D.*

Now: Cameras You Load Like a Gun

Exciting new pop-in-place film cartridges from Kodak let you load, aim, and shoot in seconds

By Bob Hering

I'VE just had a look at four new automatic cameras that introduce a great idea in the popular-price field: They end conventional film loading. Gone is the fuss and fumble. Now you simply pop in the film and shoot—as fast as you can load a gun. The new automatics also set your exposure for you, have a built-in pop-up flash holder, and even change shutter speed to suit either indoor or outdoor shooting.

The key to the new system, just announced by Eastman Kodak, is a preloaded film cartridge. Drop in a cartridge, close the camera, and you're ready to shoot. When you've finished a roll, you lift out the cartridge and send it off for processing. All of Kodak's four new Instamatic cameras use the sealed Kodapak cartridges. The advantages:

- You can safely change a cartridge in bright sunlight because it's completely light-tight.

- It's impossible to load a camera in the wrong way; the chamber accepts the cartridge only in the right way.

- On three of the four cameras, a notch in the cartridge automatically sets the exposure mechanism to match the speed of



Loading an Instamatic camera is easy. Just open the camera back, drop in the film cartridge, and snap the back shut (1 and 2 above). Through the window in the camera back (2) the type of film and number of the next exposure automatically appear. For flash, you simply pop up the built-in flash holder (3), insert bulb, press shutter release (4).

Instamatic 300 includes an electric-eye automatic exposure control, a fixed-focus f/8 color-corrected lens, pop-up flash holder with automatic shutter-speed shift from 1/60 for outdoor shooting to 1/40 for flash. Price of camera is about \$45.

Deluxe model 700 has, in addition to the convenient features of the three lower-priced models, a fast f/2.8 lens, speeds from 1/30 to 1/250, and a projected frame finder with low-light signal and focusing symbols. It's the costliest: about \$110.

Medium-priced model of the new line is the Instamatic 400. The distinctive feature of the 400 is its motorized film advance. Spring power lets it take 10 exposures in 10 seconds. You can snap picture sequences rapidly. Price is about \$53.



Budget-priced Instamatic 100 has fixed-focus f/11 lens for shooting from four feet to infinity, plus rapid film-advance lever. Shutter shifts automatically from 1/90 to 1/40 when flash holder is popped up. Price: about \$16.

Loading is foolproof with the new Kodapak film cartridge shown above. No film leaders or sprocket teeth to worry about—you simply drop the cartridge into the camera. You can't go wrong; there's only one way to do it.

the film. (The 100 model is the exception.)

The new cameras are surprisingly compact. Three are four inches long; one is five inches. Features common to all four models include: film advance with automatic film stop, double-exposure prevention, and built-in pop-up flash holders.

Four different 126 films are packed in the cartridges: Verichrome Pan, Kodachrome-X, and two new films—Kodacolor-X and Ektachrome-X. This gives you a choice of color prints, color slides, or black-and-white prints. Both Kodacolor-X and Ektachrome-X are twice as fast as the regular

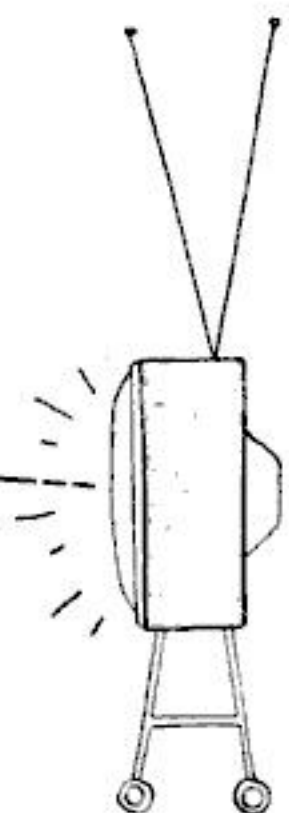
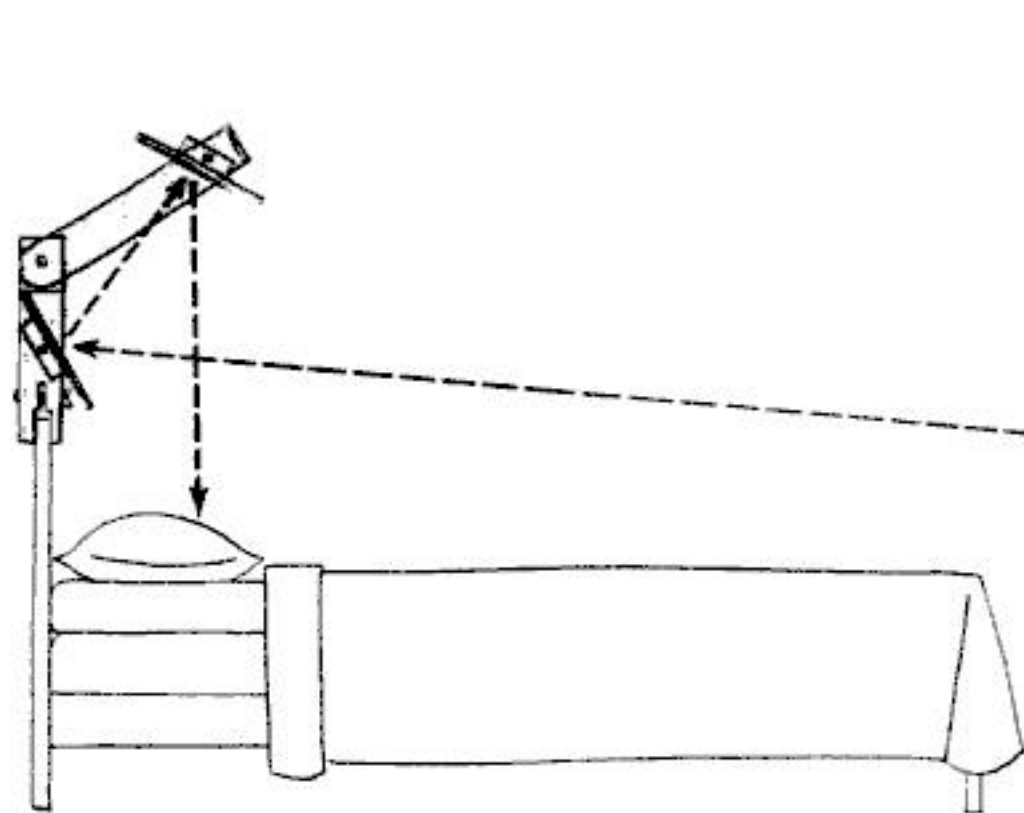
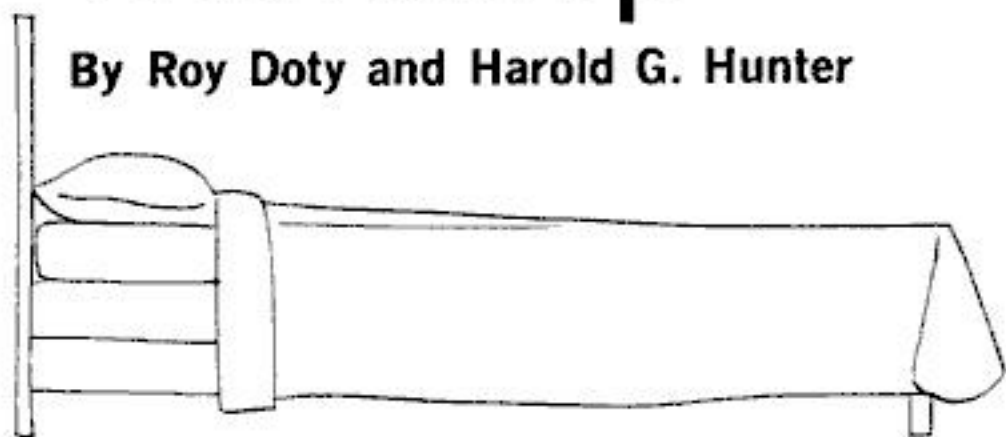
Kodacolor and Ektachrome they replace.

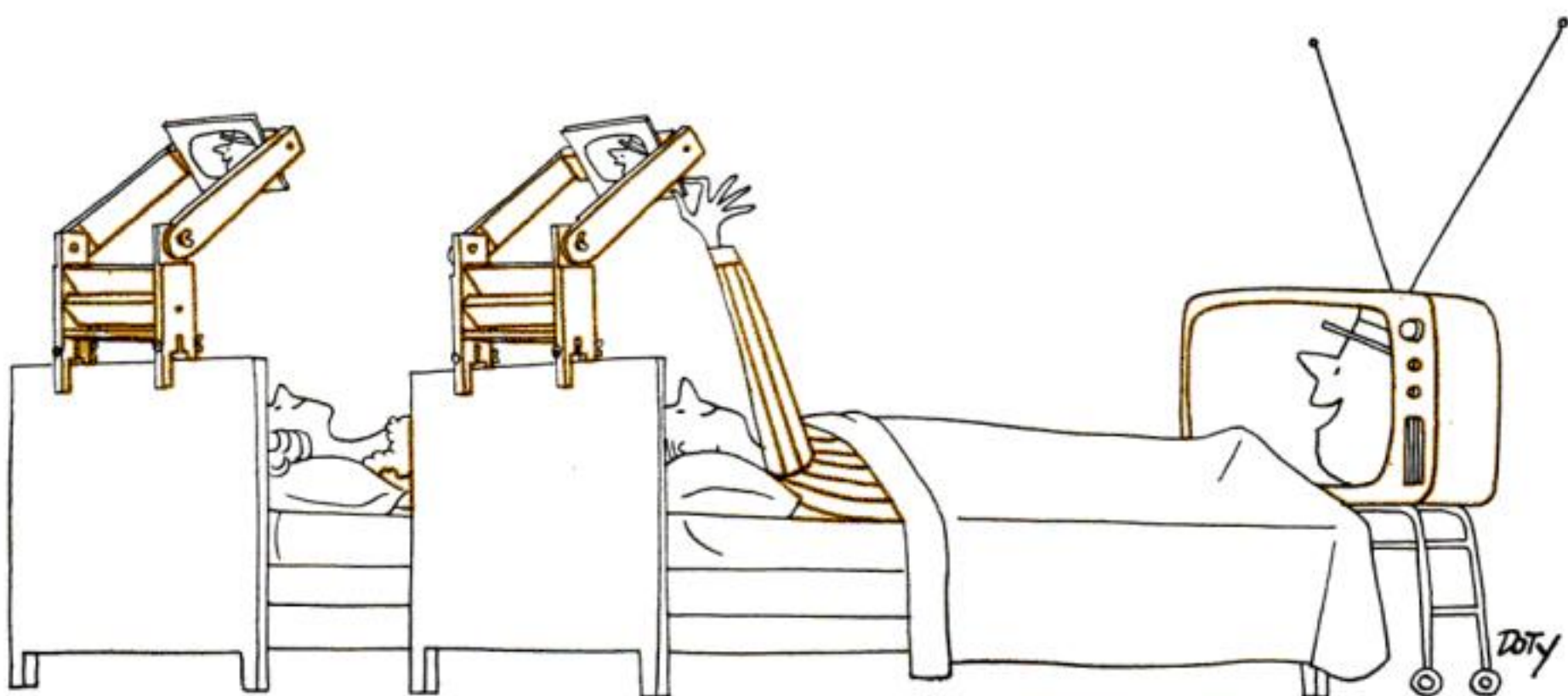
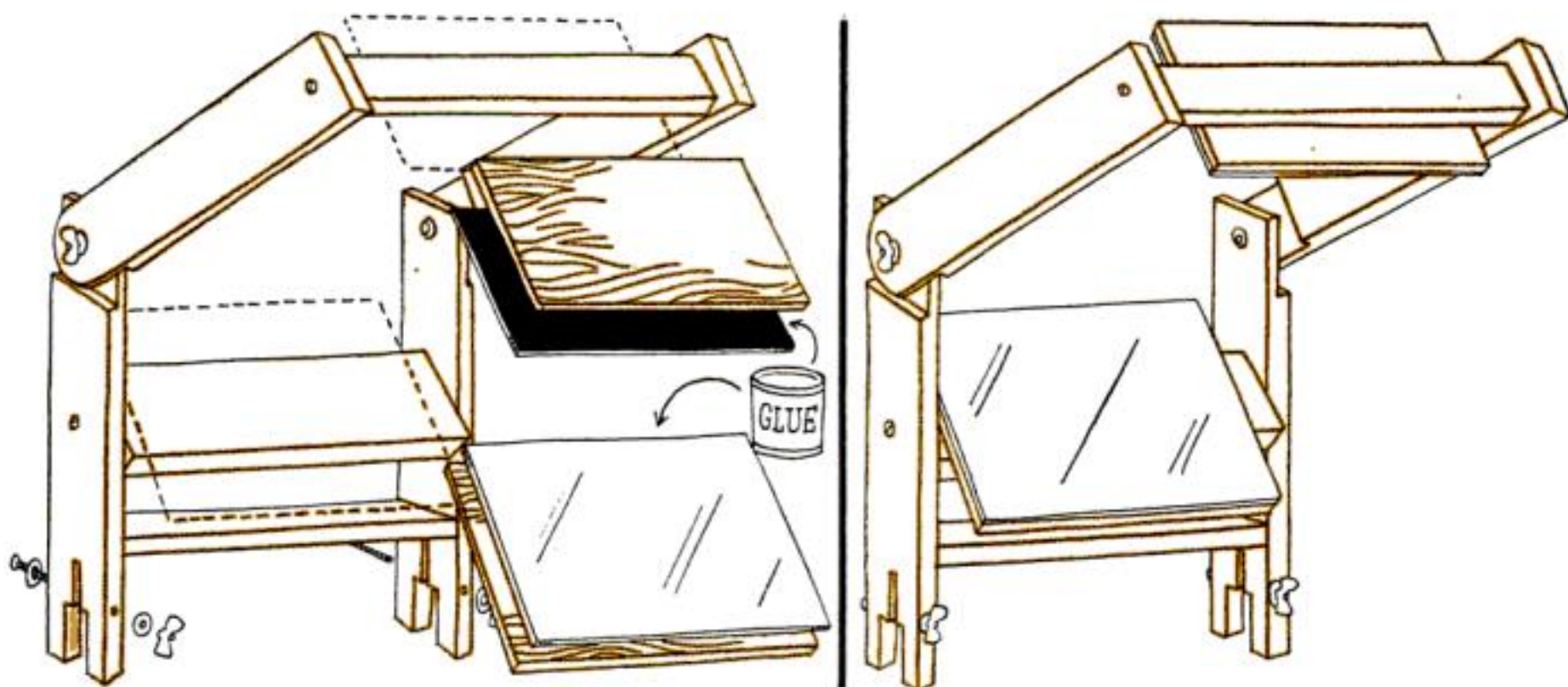
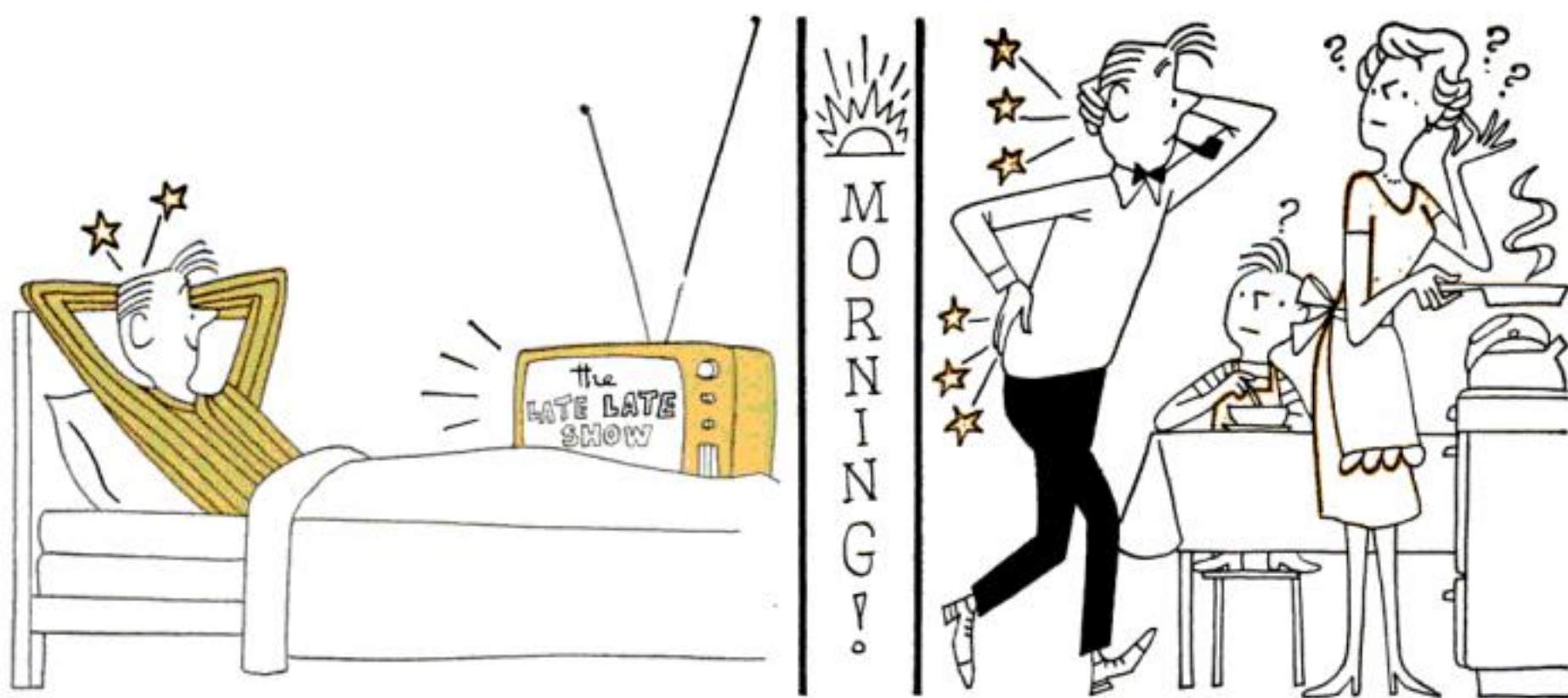
The built-in flash holders pop up to operating position on release of a catch. You can leave a fresh flash bulb in the holder without firing it; it can't go off with the reflector down. As the bulb pops up, the shutter sets itself for flash. On the 700 model, the correct lens aperture for flash is set automatically as you focus in the 3- to 25-foot range.

Advancing the film is simplicity itself. A short-stroke lever operates rapidly with your right thumb. On the 400, there's a motorized film advance.

Wordless Workshop

By Roy Doty and Harold G. Hunter



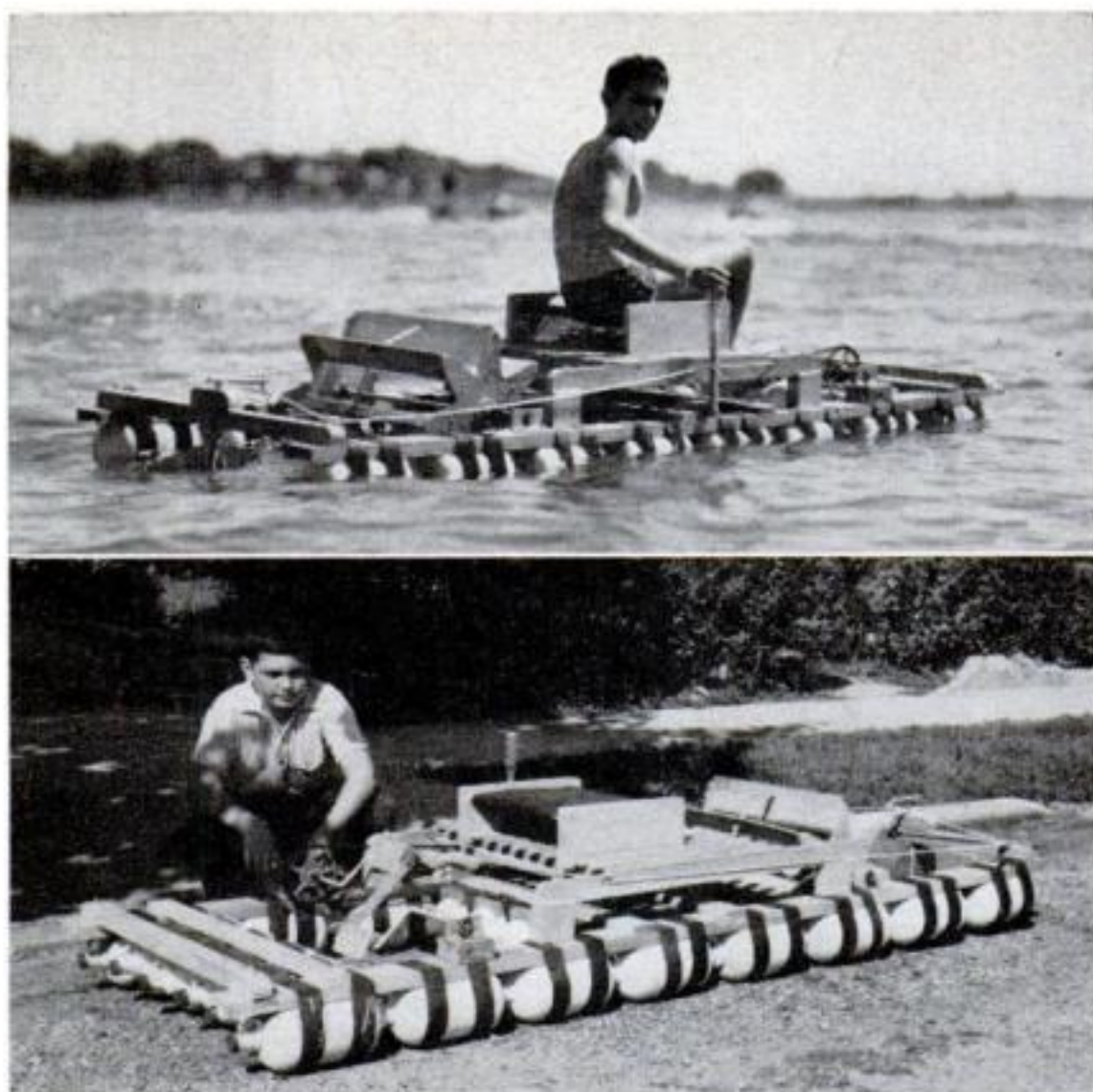


Self-propelled raft buoyed on air

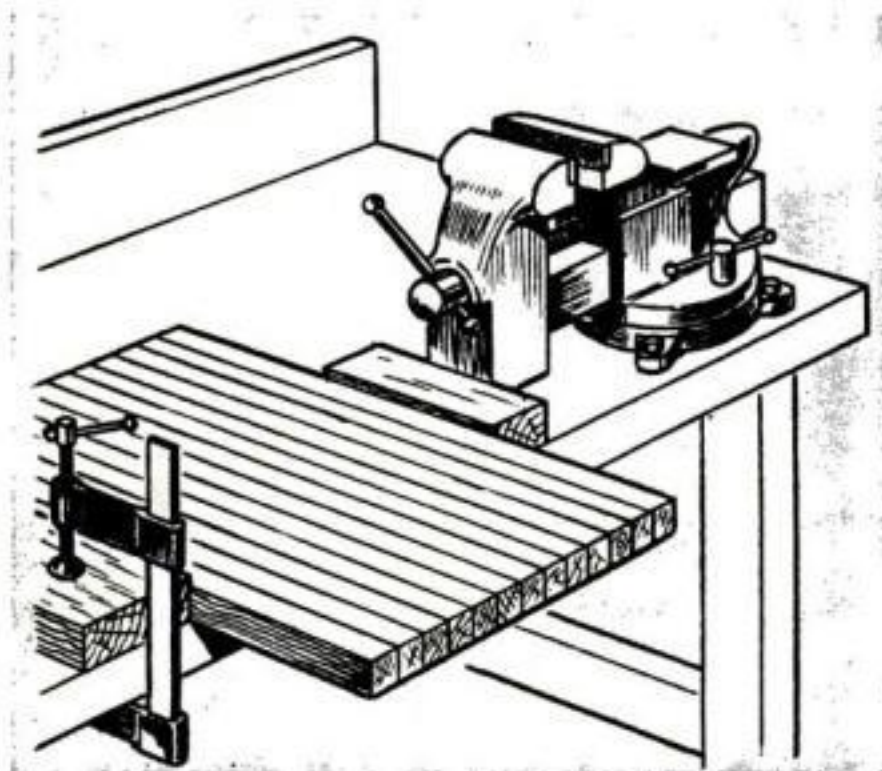
A water vehicle like this one will never break speed records, but it offers inexpensive fun afloat for both kids and adults.

The cost of materials for this 9'-long pedal craft is negligible. It's buoyed up by discarded plastic bottles—30 one-gallon containers of the kind your wife buys bleach in at the supermarket. I secured the bottles to the frame with 2" bands of rubber made from inner tubing. The frame can be made from whatever lumber you have on hand.

The drive mechanism for the large rear paddle wheel is the same propulsion system used on a kid's pedal car. There's no motor

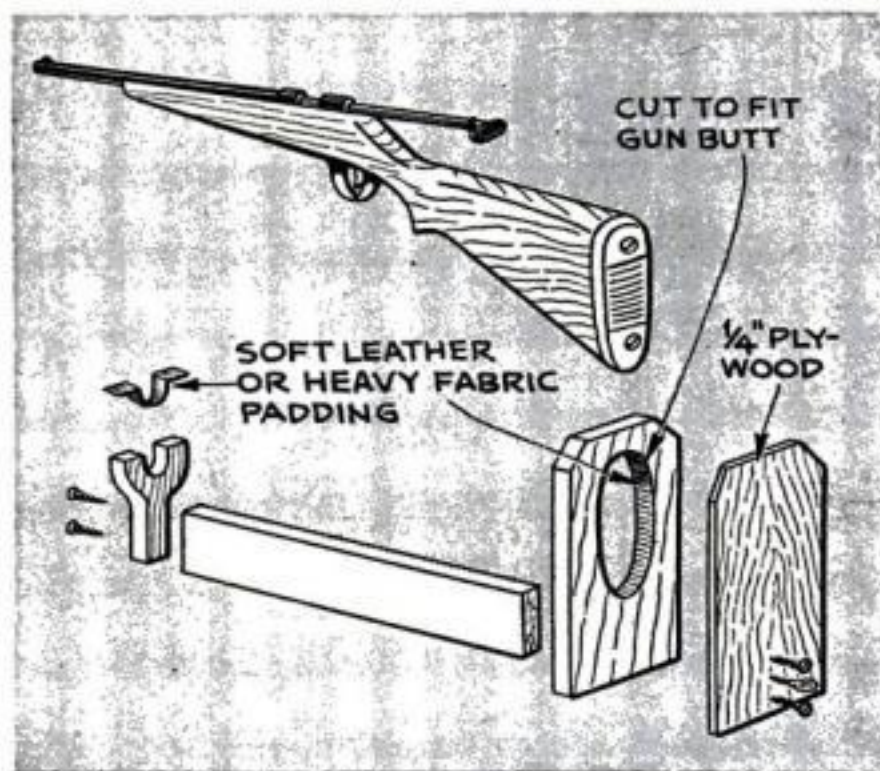


to fool with—and the ignition system is certainly waterproof. The little craft is fine for calm-water pedaling or lazy fishing on a quiet stream.—*Edward Simon, NYC.*



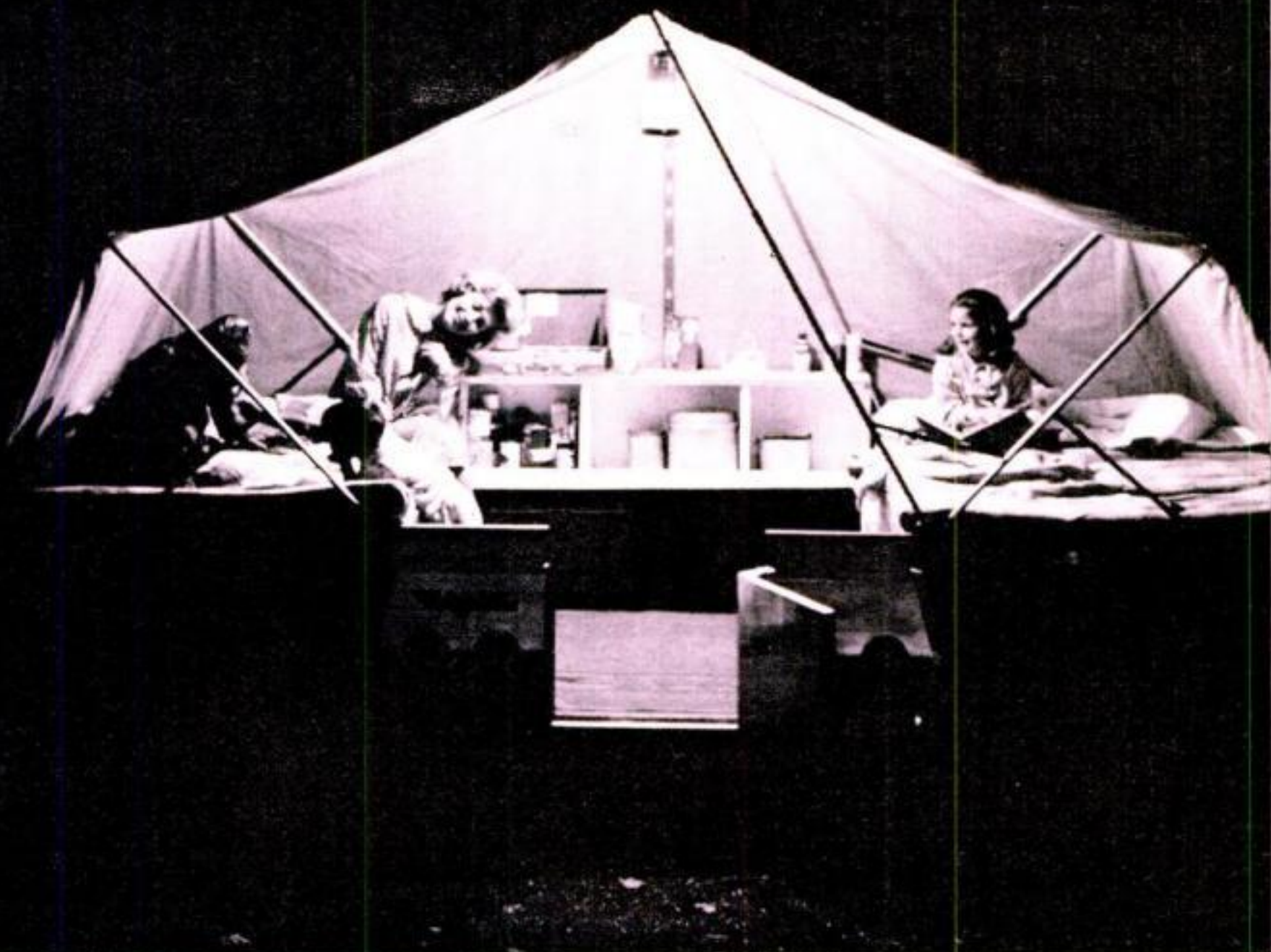
Vise substitutes as clamp

To do a big glue job, I needed longer clamps. As a substitute, I rigged up this arrangement. On one side, I made a bench stop by clamping a wooden block to the workbench. On the other side, I used my machinist's vise and a buffer block to apply pressure. The buffer block kept the vise from marring the workpiece. Careful, though—too much clamping pressure will buckle the boards.—*Joseph Schiller, Milwaukee.*



Gun mount for rifle cleaning

Your rifle will last longer and shoot straighter if cleaned after each use. Since the rod may carry grit, to save the muzzle end you should clean the barrel from the breach, where possible. But it's mighty unhandy to hold the rifle with one hand and work the rod with the other. I solved the problem with a mount (above), made from two-by-four, scraps of plywood, and a bit of soft leather.—*James W. Davis, Boise, Idaho.*



Vacationing on Wheels

Tent Trailers
Camping Vans
Piggyback Campers
Car-Top Sleepers
Station-Wagon Tents . . .

Tent trailers like these—shown in use above and on the road at right—will be more popular this year than ever before. (Photos courtesy Vesely Mfg. Co.)



. . . all on
the following
26 pages



TENT TRAILERS

buy or rent one

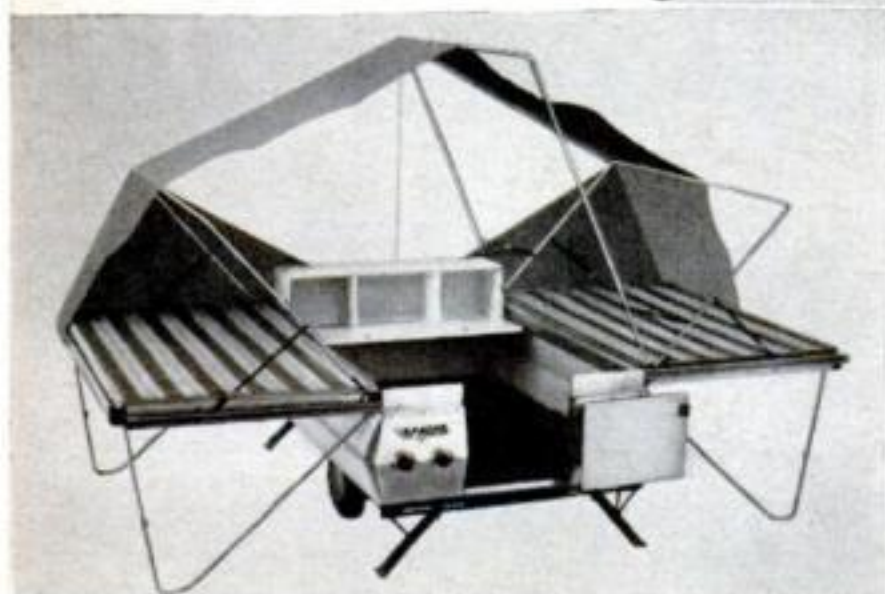
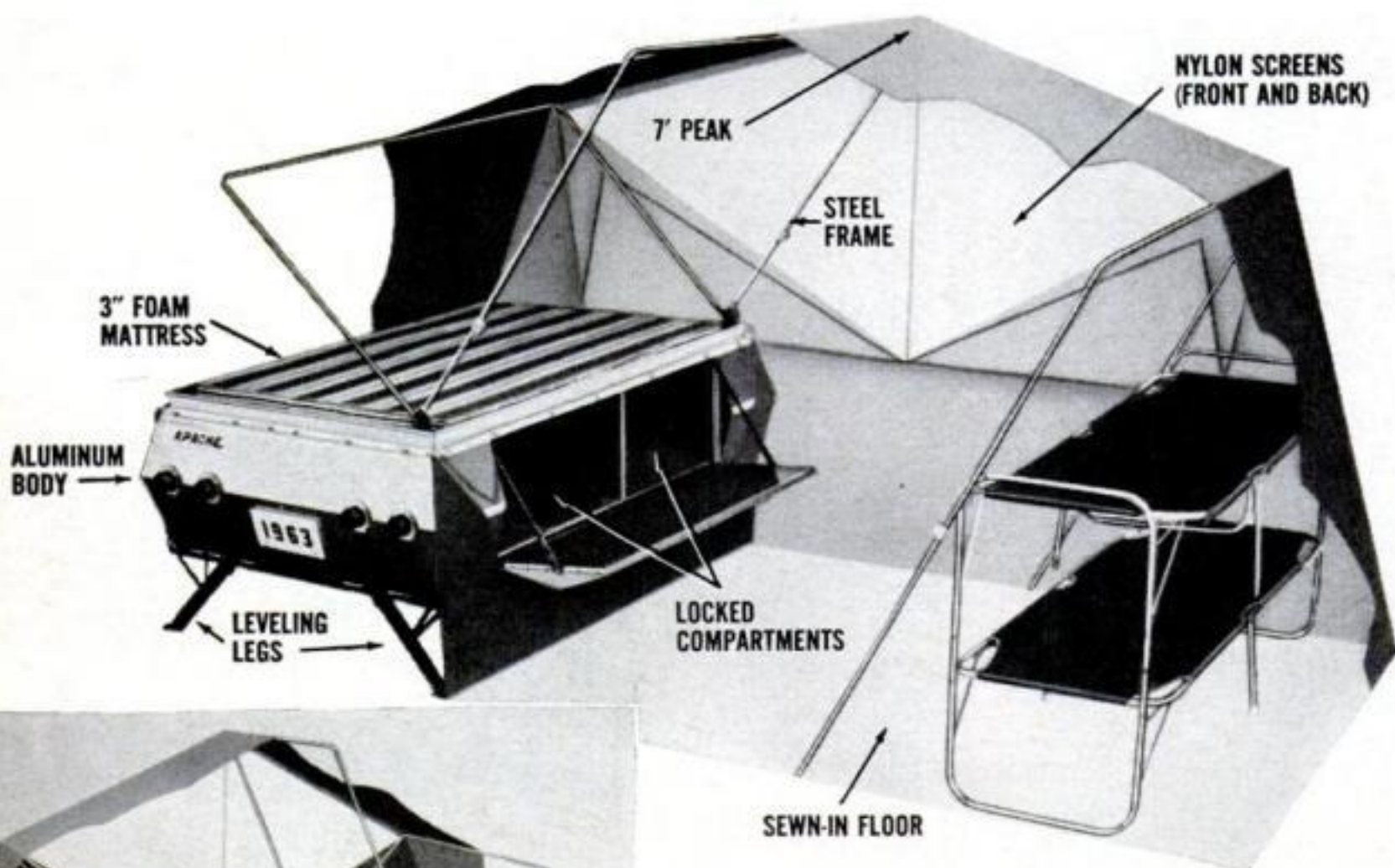
HOTTEST item in camp shelters this year is a cross between a tent and a trailer. You trail a low and compact box on two wheels behind your car. At the camp site, you fold out a tent on a metal frame to make spacious living quarters.

Pioneered in recent years under such trade names as Apache, Nimrod, and Heilite, pop-up camping trailers have broken out all over the map this season. New manufacturers are hustling into the field and more rental agencies are catering to those who would rather rent than buy one.

Pop-ups have all the appeal of tent camping. But taking down a soaking tent and trying to pack it in your car is no part of the fun. Tent-trailers go up faster than the simplest tent, and provide bunks (often all made up) and extra storage space.

Those who have used pop-ups say that they offer one of the most satisfying ways of vacationing on wheels. They are comparatively inexpensive (from \$375 to \$850), they tow easily on the road, they do not obstruct your vision to the rear, they are a cinch to store, and their light weight results in gas economy. You can even manhandle a pop-up easily into an off-the-road camping site.

Tenting on wheels. The new pop-up tents pack into a trailer 7' to 8' long, 4' to 6' wide, and about 3½' high. There are two basic styles: an off-the-ground type with a



Two basic models of pop-up camping trailers are illustrated here: an on-the-ground type, above, and off-the-ground type, at left, both Apache deluxe models. The Chief, above, has a sewn-in floor attached to the tent, weighs 410 pounds (net), and costs \$525 (f.o.b. Lapeer, Mich.). The Eagle, at left, has two bunks, weighs 550 pounds, and is priced at \$645.



Off-ground types: At left is Nimrod's Riviera, priced at \$639 f.o.b. It has two double bunks that open out fore and aft of the steel trailer. In

contrast, bunks on the Two Star (\$599) at right open out, like wings, on either side of the trailer. Nimrod's third model is on-ground type.

fold-out bed on each side; and an on-the-ground model that leaves a single three-quarter bed atop the trailer, while a canvas top flips up over it and extends out to one side and down to the ground, providing room for several cots on a sewn-in floor.

All tent ads read "easily erected," but these *are*—and by one person, in about three minutes flat. Steel bows swing up and out from the trailer body, stretching

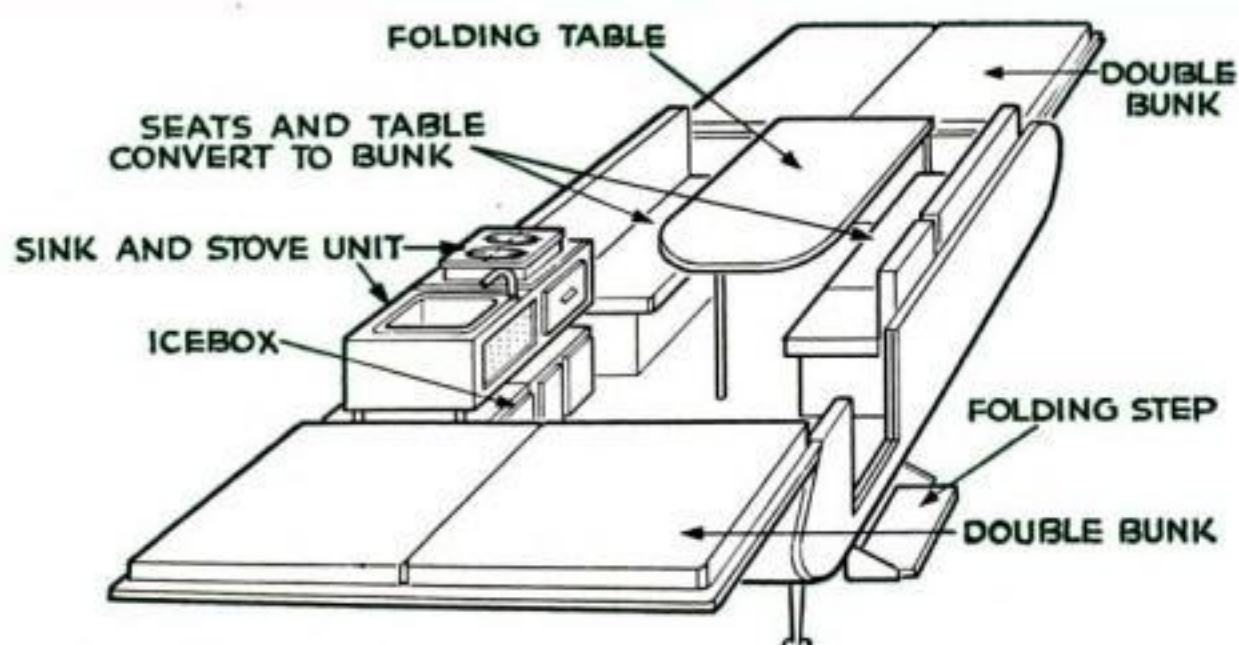
CONTINUED

On-the-ground camper sold by Sears gives you more than 100 square feet of space when set up as shown below. Ready for the road, as at right, the outfit provides 40 cubic feet of storage space. All tent trailers are low enough so the driver can see to the rear without obstruction.





All comforts of home go along in the Trade Winds Continental—including sink. Kitchen unit and table can be removed for use outdoors. Kitchen unit includes double-action pump. A portable propane heater is also included. Flaps on front and rear windows can be propped up as canopies. Prices: \$795 to \$1,200 (f.o.b.).



the canvas top taut. Adjustable legs pull down from the vehicle, supporting it firmly even on rough terrain. A large canopy with side curtains (optional) almost doubles interior space, and screened windows can be zipped closed from the inside.

As in all camping equipment, specifications tend to exaggerate—beds that “sleep

two” range from 3” to 10” narrower than a standard 54” double. Thirty to 60 cubic feet of storage space isn’t quite as much as it sounds; and in off-the-ground models, the storage must be emptied to provide floor space when the tent is in use.

Easy on the road. Compact size and spring suspension make pop-ups a cinch to handle, and their low height (39” to 45”) gives excellent rear vision. Weight (from 340 to 650 pounds, according to model) is nicely balanced, with no more than 50 pounds down-weight on your rear bumper. Interior storage space holds 300 to 400 pounds of extra gear, freeing your car of

[Continued on page 192]



A metal sink is also included in this Right-Sprite, made by Right Products. And there’s a plastic tank in which you can carry along five gallons of water. Factory price is \$595.

CAMPING VANS

buy or build 'em

ANY of the new small vans can now be fitted out as a roomy mobile camper. Shown here are three converted campers you can buy already equipped. The one above and at right is based on the Volkswagen Microbus. The two below are the Ford Econoline (left) and the Chevy Greenbrier (right), the windowed version of the Corvan shown on the next page.

The camper conversions provide seats that fold into beds, a dining table, cabinets, and curtains. Extras include sinks, stoves, refrigerators, water tanks, chemical toilets, and hook-on side tents. For panel-truck models, the kits also contain windows. Prices run from about \$400 to \$800.

For three camper conversions you can make yourself, see the following pages.



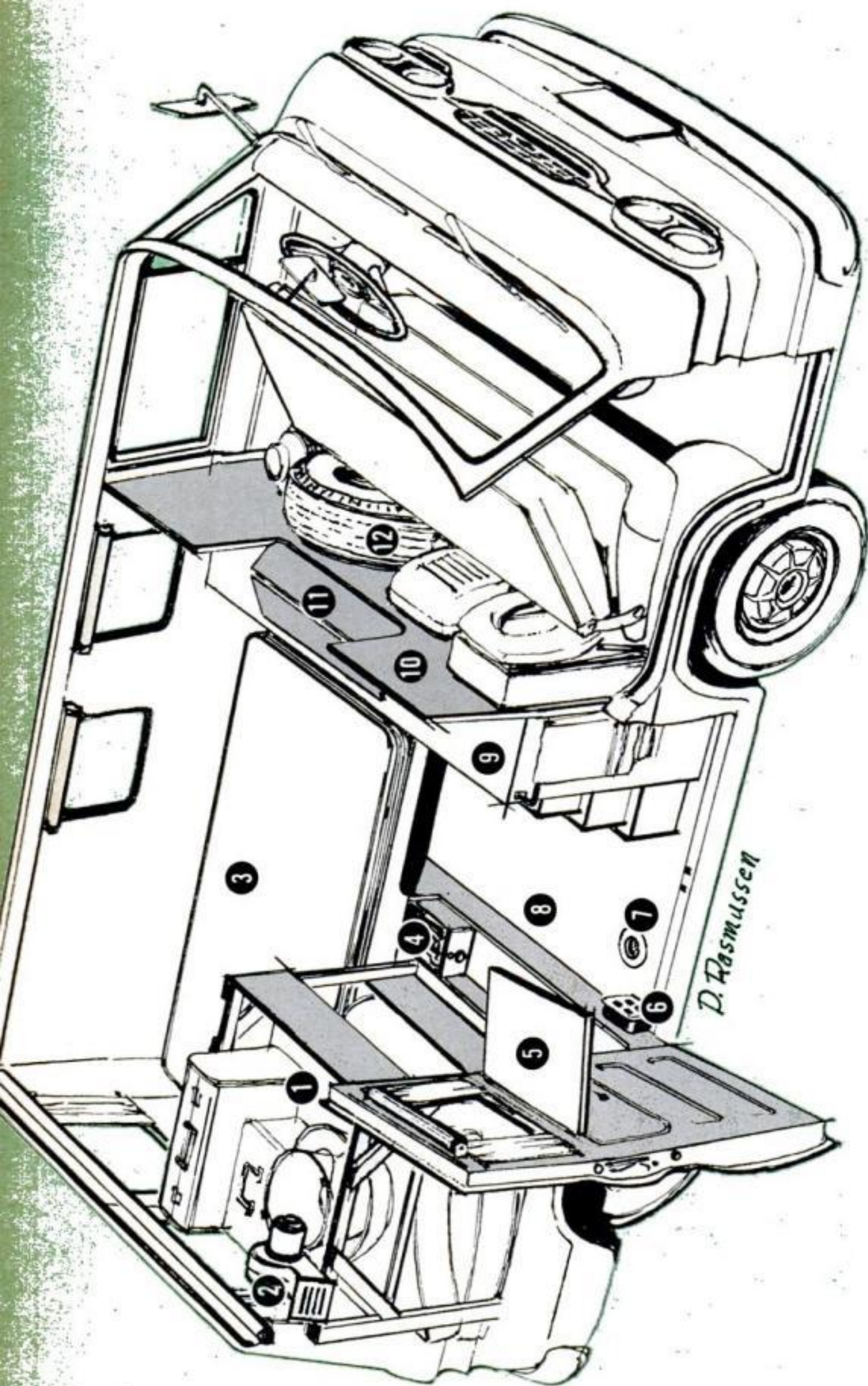
This VW camper sleeps six—four inside and two in roof-top bunk. Side tent adds outdoor shelter. Kits are installed by VW dealers.



Once a panel truck, this Econoline sports windows, living quarters. Conversion kit is sold by Sportswagon Kamperkits, Highland, Calif.



There's even a sink with running water and an icebox in this converted Greenbrier. Camper kits are available through Chevrolet dealers.



1. Luggage rack
2. Exhaust fan
3. Permanent bed doubles as sofa
4. Tool drawer under bed
5. Folding table on door
6. 110-volt outlet

7. Floor drain
8. Space for second bed
9. Ready-made dresser
10. Partition for privacy
11. Hinged panel for driver's rear view
12. Storage space behind front seat

How to fit out a CORVAN as a camper



Temporary bed (foreground) rests on hinged plywood support in front. When not in use, support is folded up and stored, along with mattress, under luggage rack.

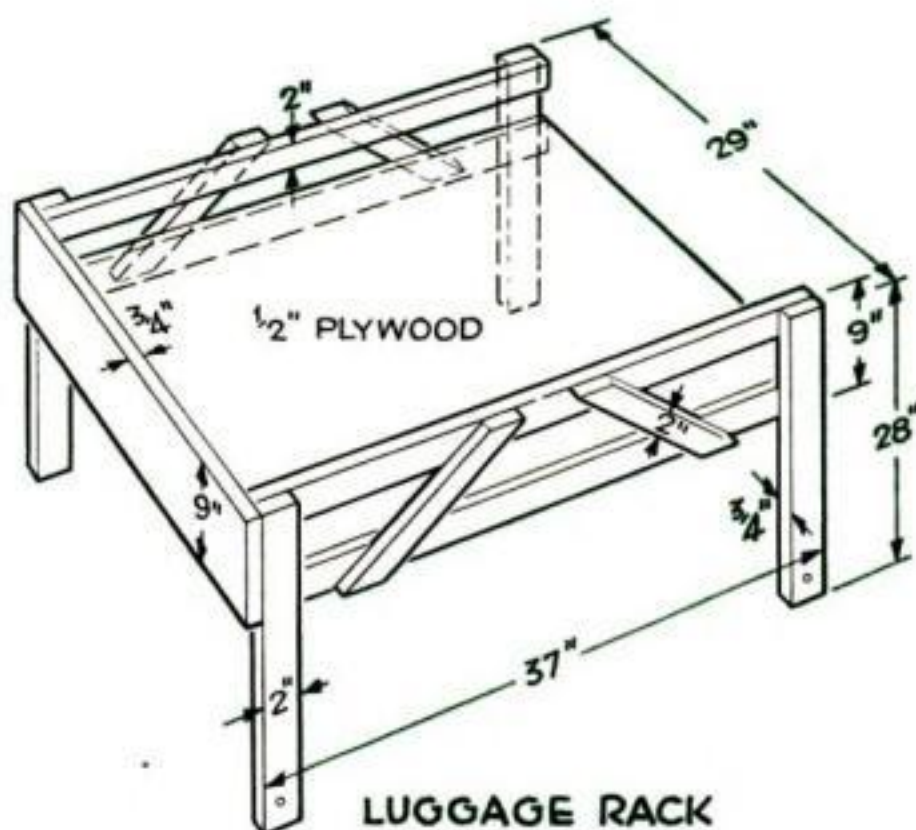
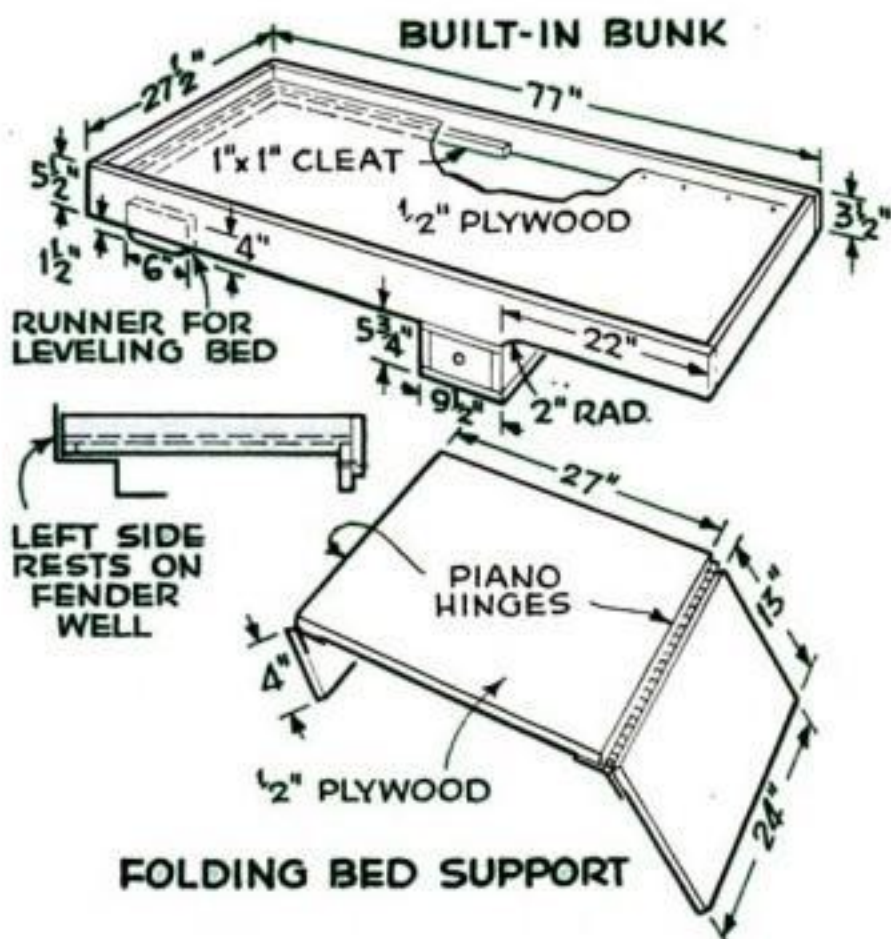


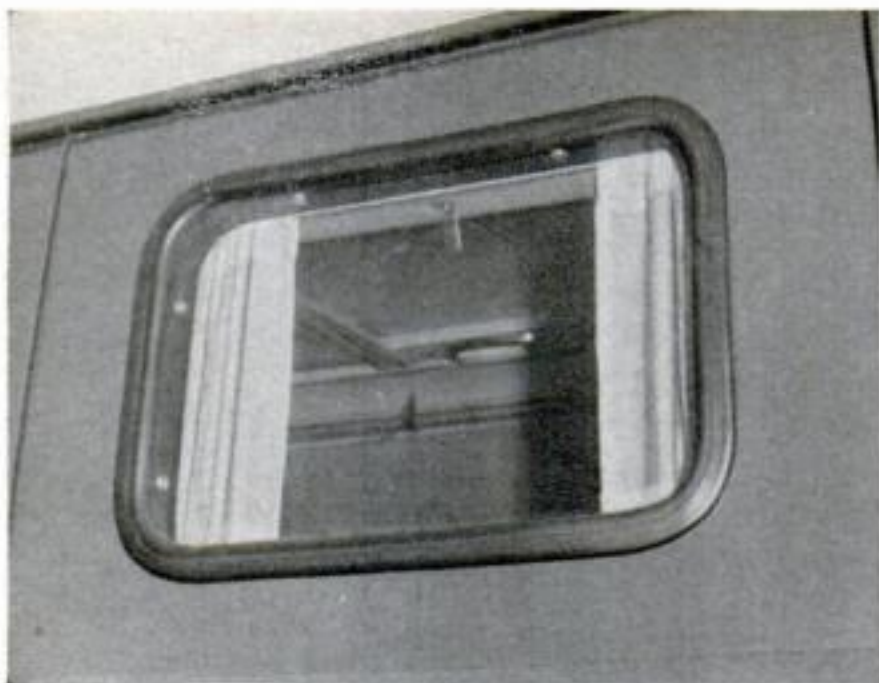
For sleeping, sofa on left side becomes one bed. Other bed is set up under luggage rack on right side.

YOU might think that a panel truck is a fine thing to deliver groceries, but hardly a camping rig. Chet Chatman of Red Bank, N. J., proved otherwise.

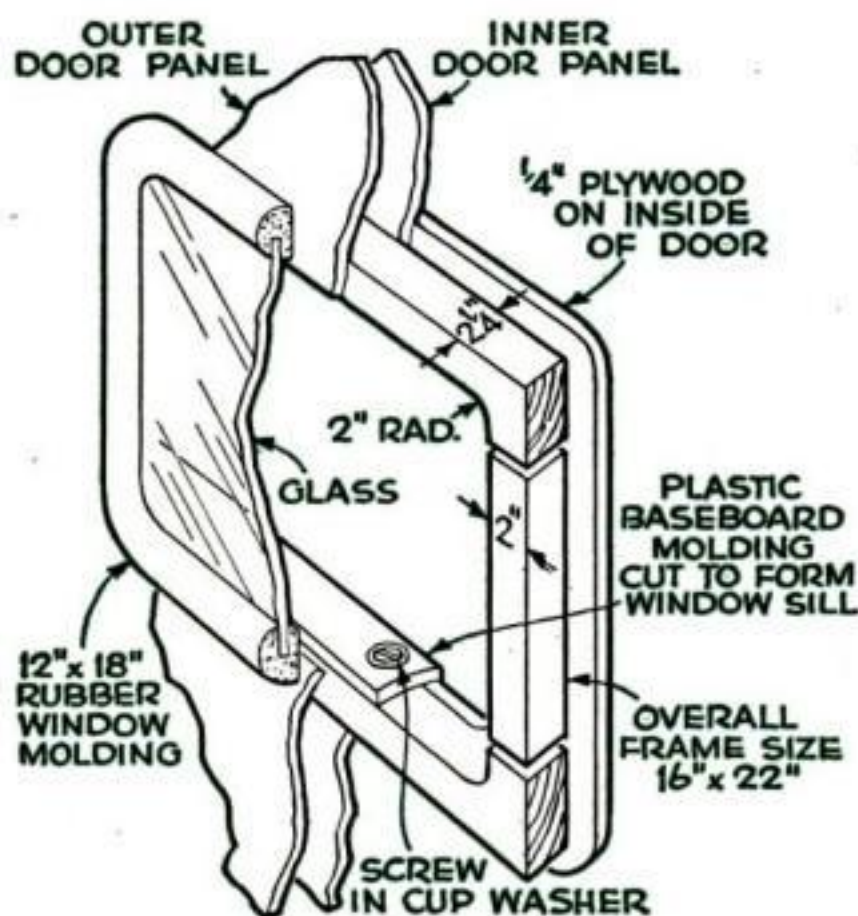
He bought a Chevy Corvair Van, familiarly known as a Corvan, and installed windows, put in beds and other furniture, built in a privacy wall behind the front seat, and doodled up an ingenious mount for a detachable awning. The result, shown on these pages,

CONTINUED





Professional-looking windows like this one can be installed by yourself with stock auto-glass parts. Opening is first cut in outer body panel with a saber saw (with blade broken off short to avoid striking inner panel). Inner panel is then cut in same way. Wood filler blocks are screwed between the panels to form a solid rim, as shown below. Rubber window molding hooks into the opening, and glass snaps into the molding, locking into place.

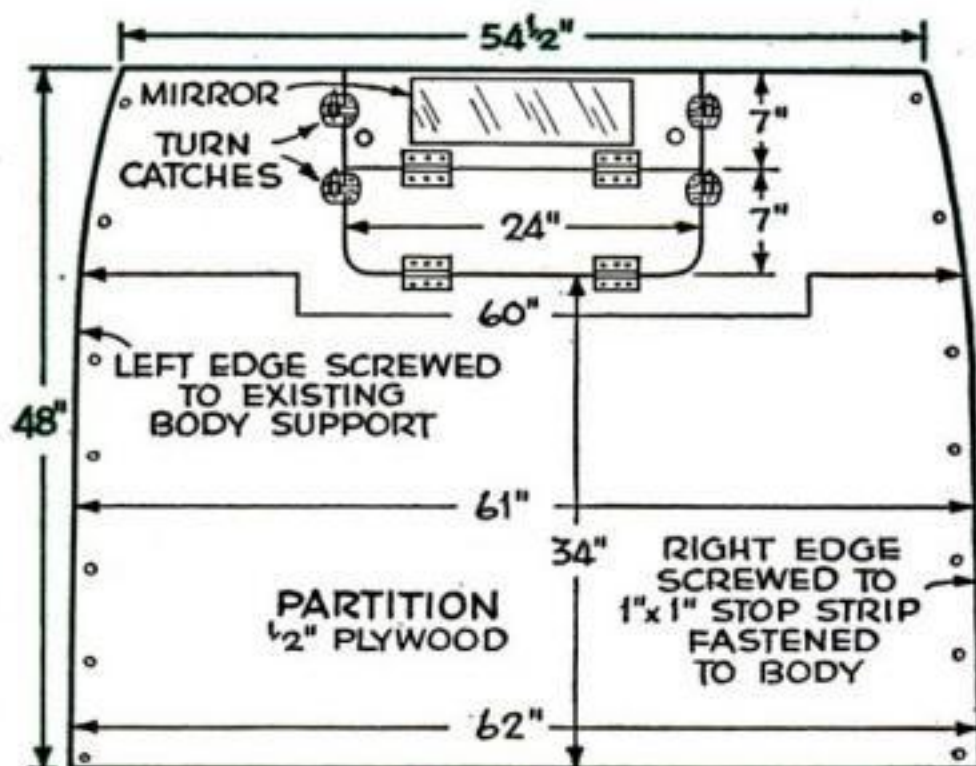


is a rugged mobile camper that can go anywhere and provide a cozy home-away-from-home in any weather. It sleeps two adults on full-length beds in the rear and a child across the front seat.

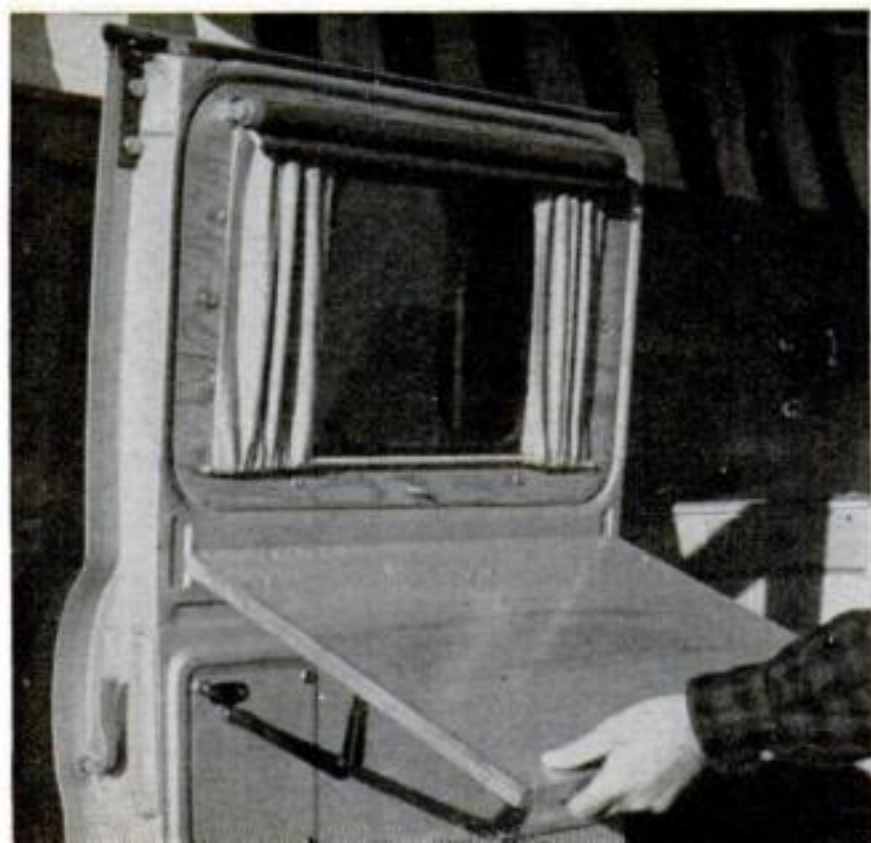
Why a panel truck? Chatman gives two good reasons. First, a truck generally sells for considerably less than vans designed for family use; it's a bare shell with no windows or fancy interior fittings. Second, because you're buying just space—a whopping 160 cubic feet of it—you can organize it any way you want.

Adding windows is a must, though. Besides making the living quarters homey, they have an important effect on a camper's legal classification. Without windows, Chatman found the van could be licensed only as a commercial vehicle, keeping it off parkways closed to commercial traffic. With windows, the van can be licensed as

[\[Continued on page 180\]](#)



Plywood partition behind driver's seat gives privacy in living quarters. Ready-made dresser below is 57\" wide, fits exactly across van. Drop-down table on door at left is 18\" by 23\".



How to fit out an ECONOLINE as a camper

UP TO six people can share this roomy, roving camper. It's built into a Ford Econoline bus and was designed by Ted Hyman of St. Louis. He chose an Econoline because it's a fine combination of luxury and utility that makes it ideal for camping. Its spacious windows sweep clear to the rear to provide lots of light and view in the living quarters.

At the same time, the low cargo deck stretches level all the way back, to give full-height living space throughout the entire camper. This makes possible an unusual two-level sleeping arrangement. At the top level, two bed boards stretch across the width of the bus and rest on ledges formed by the window sills. These are $\frac{3}{4}$ " plywood and are carefully cut to fit snugly into the windows but without putting pressure on the glass.

In use, the boards are laid out side by side and support two youngsters on small mattresses or in sleeping bags. When not in use, the boards are stacked out of the way at the rear.

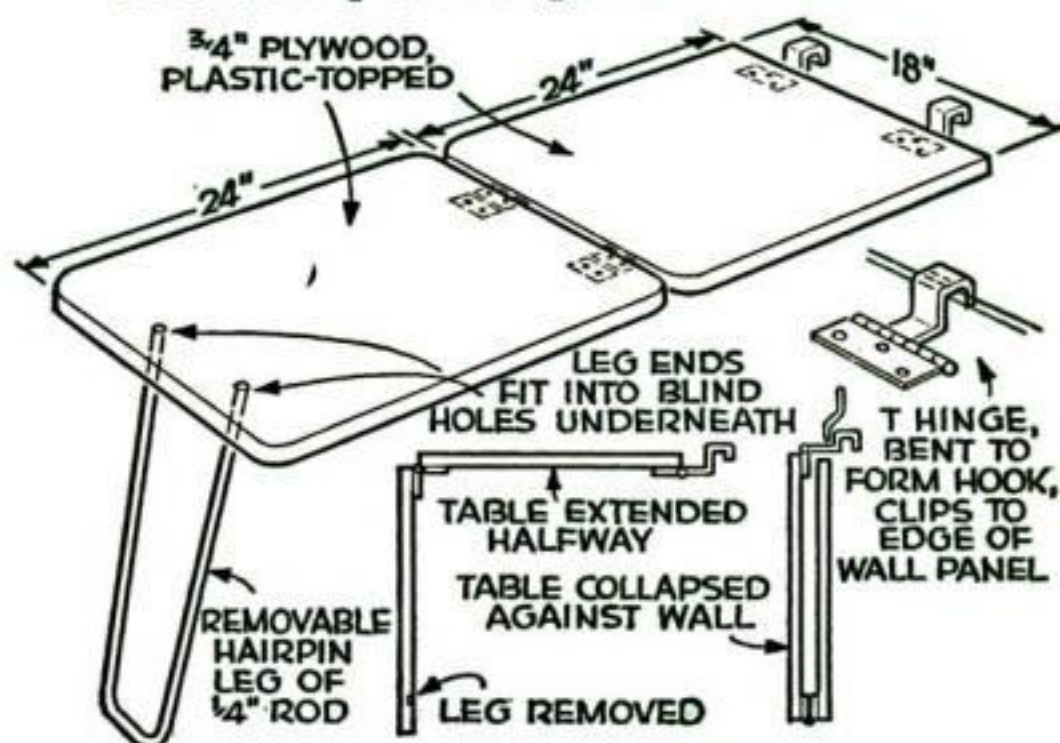
Below the level of the boards are two facing benches that provide seats by day and turn into a double bed at night. The back of the rear bench is removable and exactly fits the space between the two benches. Drawers in the benches are pulled out slightly and the back is laid out flat on them, making a solid bed platform across the two benches. A platform behind the rear bench extends the bed farther, allowing Mom and Dad to stretch their legs out under the kids' beds.

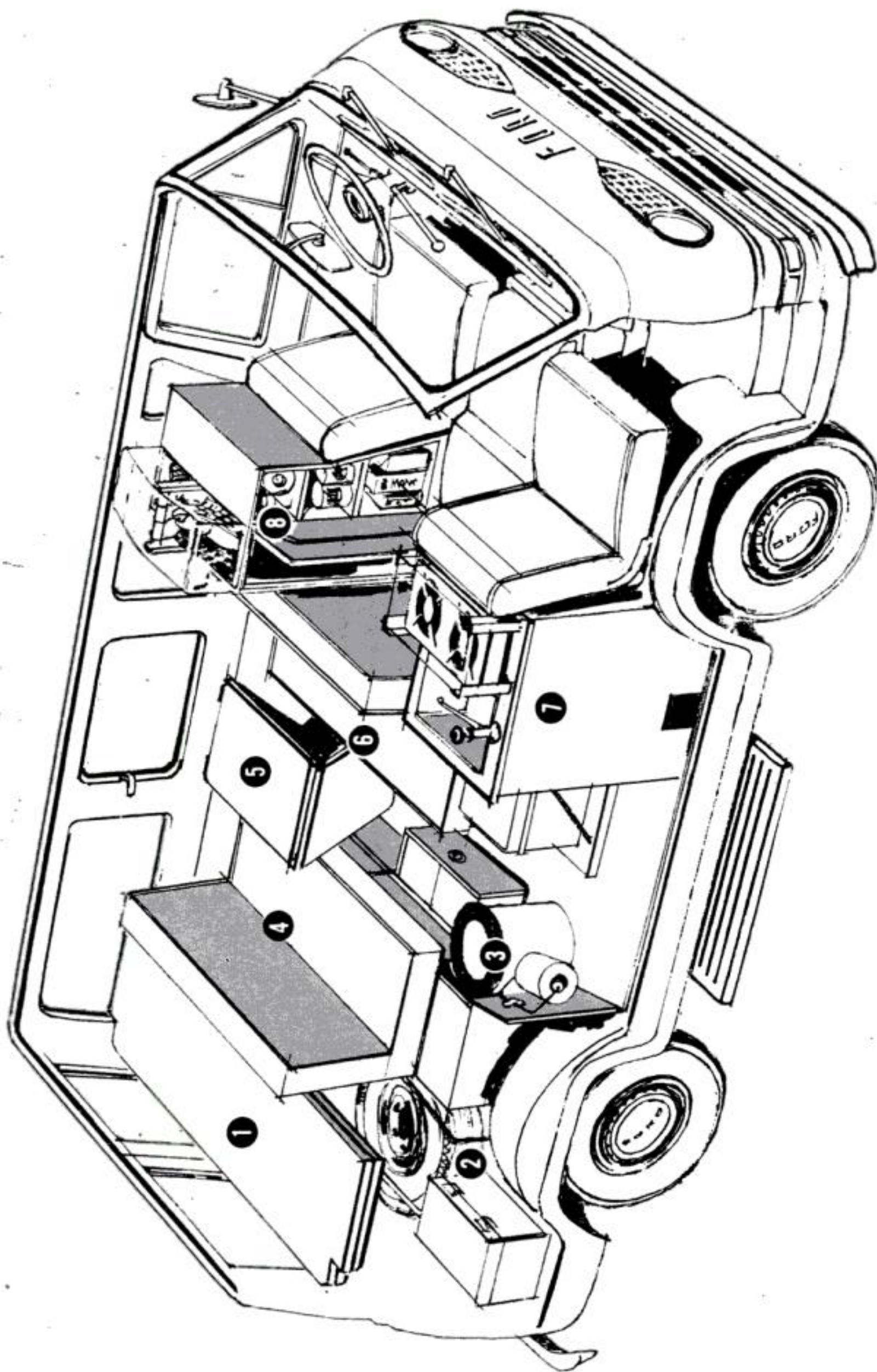
There's even room for a fifth

CONTINUED

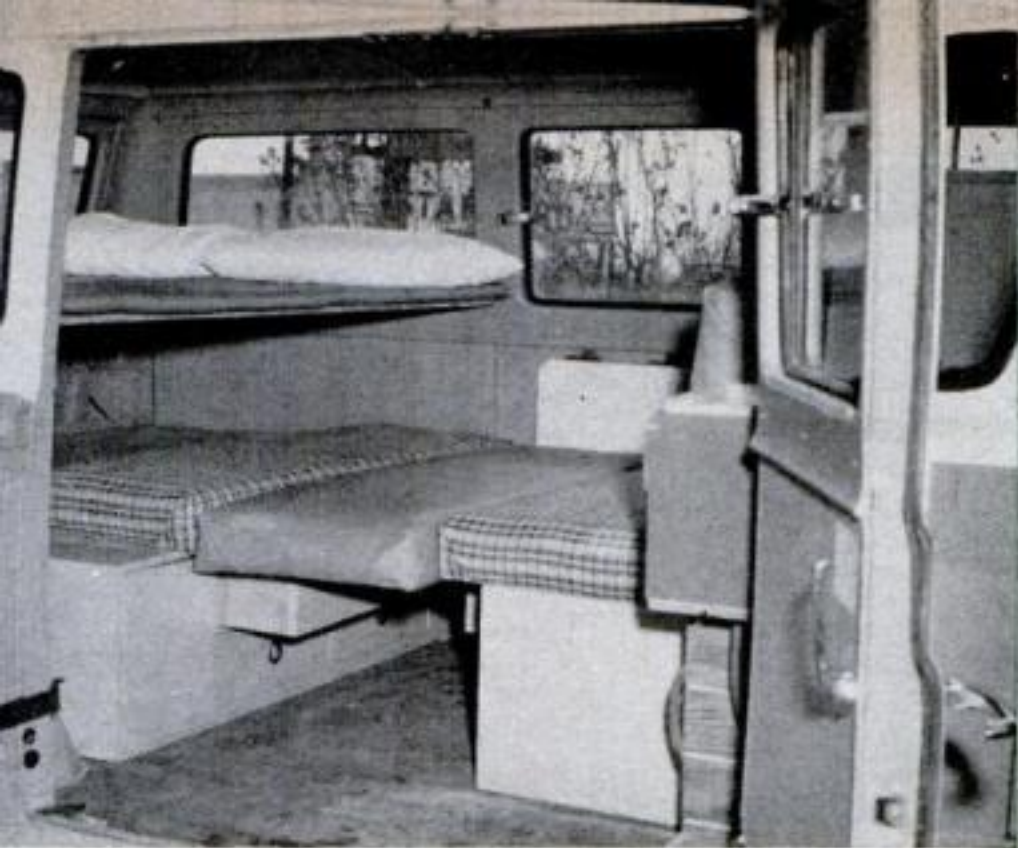


There's dining space for the whole family with this roomy arrangement. How the two-section table folds up for storage is shown below.





- | | |
|--|--|
| 1. Bed supports in stored position | 5. Collapsible table |
| 2. Storage area for equipment and supplies | 6. Front bench with storage beneath |
| 3. Toilet | 7. Kitchen unit with sink, stove, icebox |
| 4. Rear bench with storage beneath | 8. Clothes closet and food cupboard |



Rigged for night use, camper sleeps two youngsters on bed boards stretched between the windows, and two grownups on benches underneath. Note how seat back, removed from rear bench, rests on partially opened drawers between the benches to form lower bed.



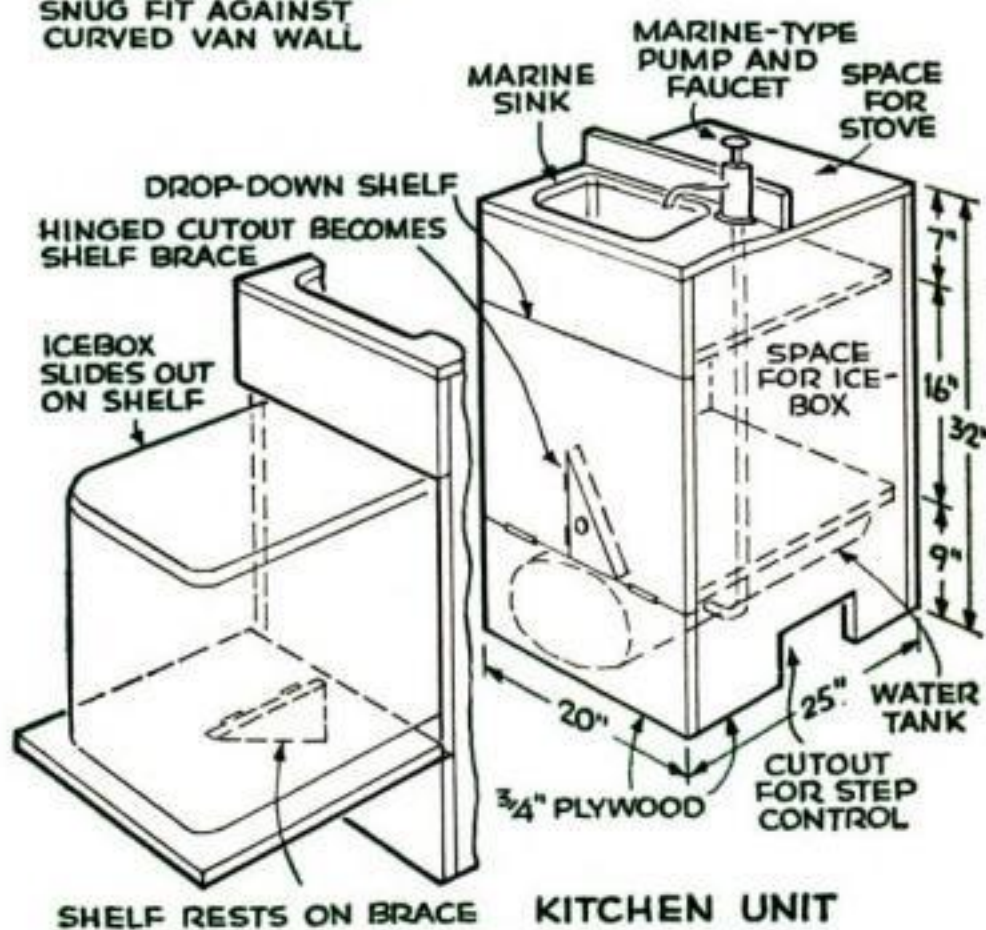
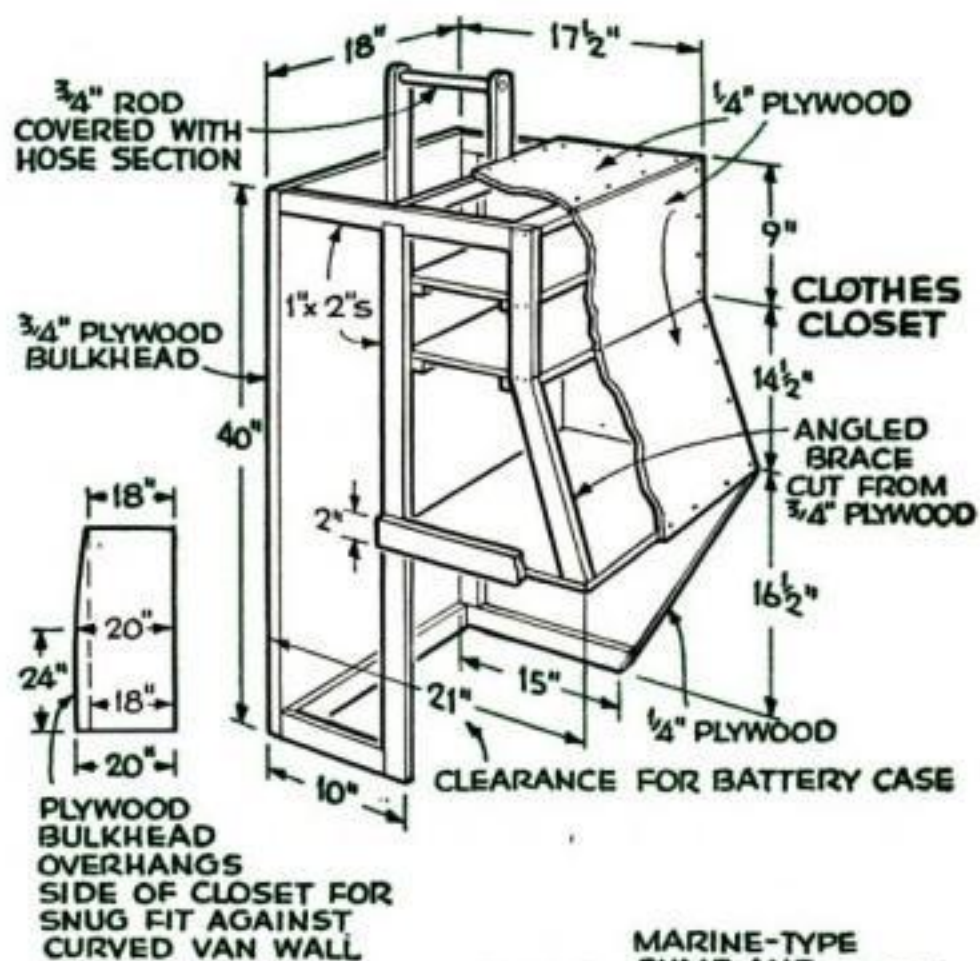
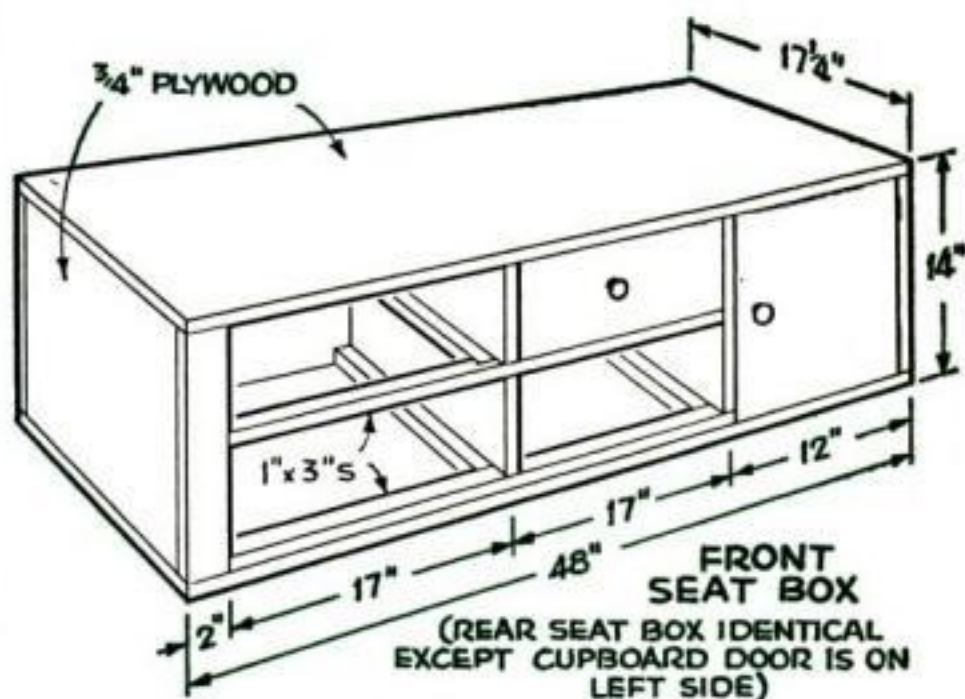
camper crosswise on the floor in the space between the two benches. And in a pinch, a sixth member of the family can bunk in the driving compartment.

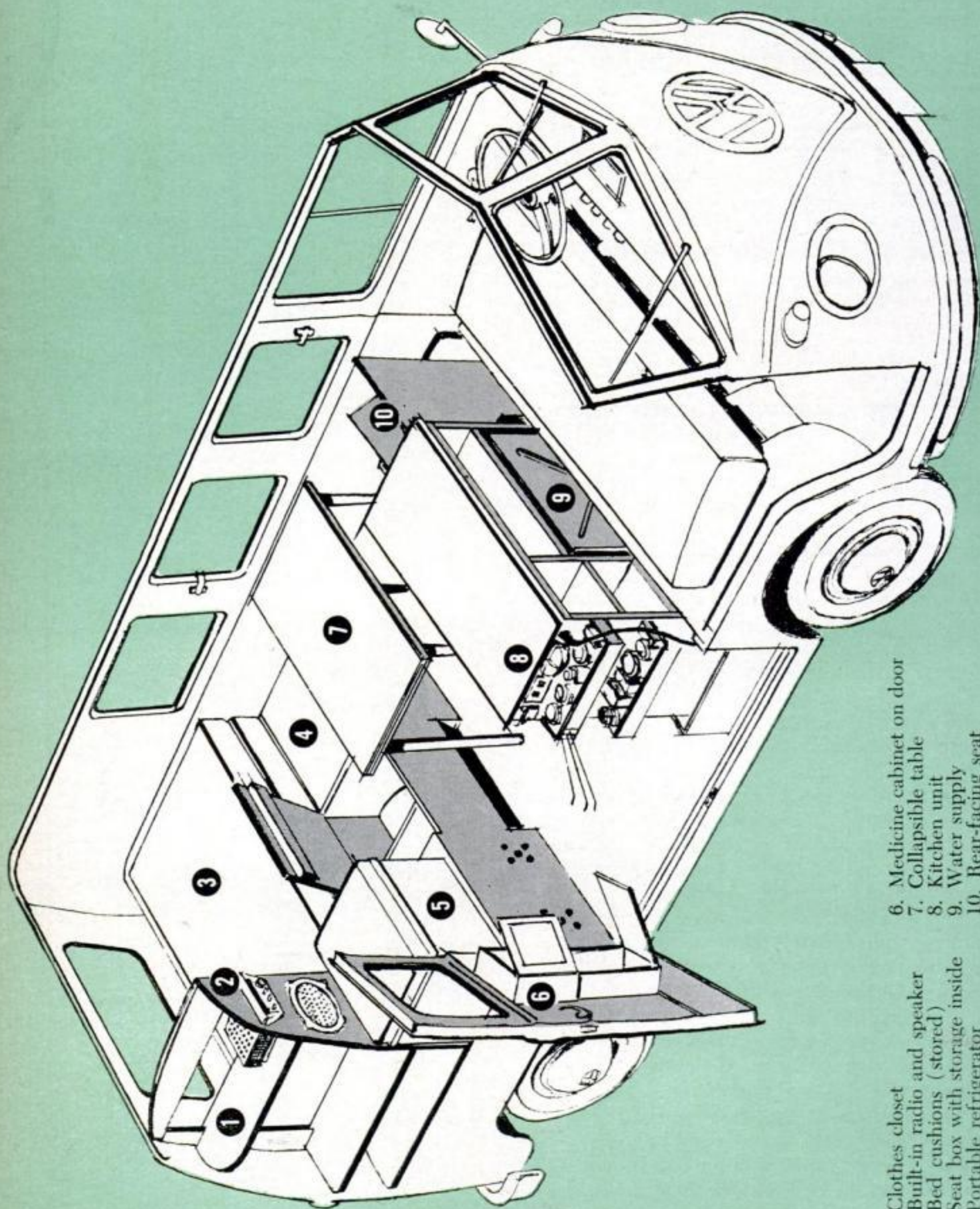
The two benches are identical in width—48"—but the rear one is slightly offset because it's centered between the two fender wheels, while the front bench sits flush against the left wall. This offset gives you space to work at the kitchen unit next to the front bench. A cupboard in the uncushioned end of the rear bench houses a small, portable toilet.

The seats and seat backs are $\frac{3}{4}$ " plywood padded with 4"-thick foam rubber and covered with vinyl upholstery fabric stapled to the back of the plywood. The rear seat back is anchored to the bench with two large barn-door-type hasps. Removing the pins from the hasps releases the seat back for use in the bed. Two bent steel rods, slipped into sockets, hold the back upright when it's used as a seat.

The kitchen unit is about as fancy as you can get in a 2'-square space. At the front, there's a small, marine-type stainless-steel sink built into the counter. At the back, there's space for a marine stove or one of the small propane camper stoves.

[Continued on page 199]





1. Clothes closet
2. Built-in radio and speaker
3. Bed cushions (stored)
4. Seat box with storage inside
5. Portable refrigerator

6. Medicine cabinet on door
7. Collapsible table
8. Kitchen unit
9. Water supply
10. Rear-facing seat

How to fit out a MICROBUS as a camper

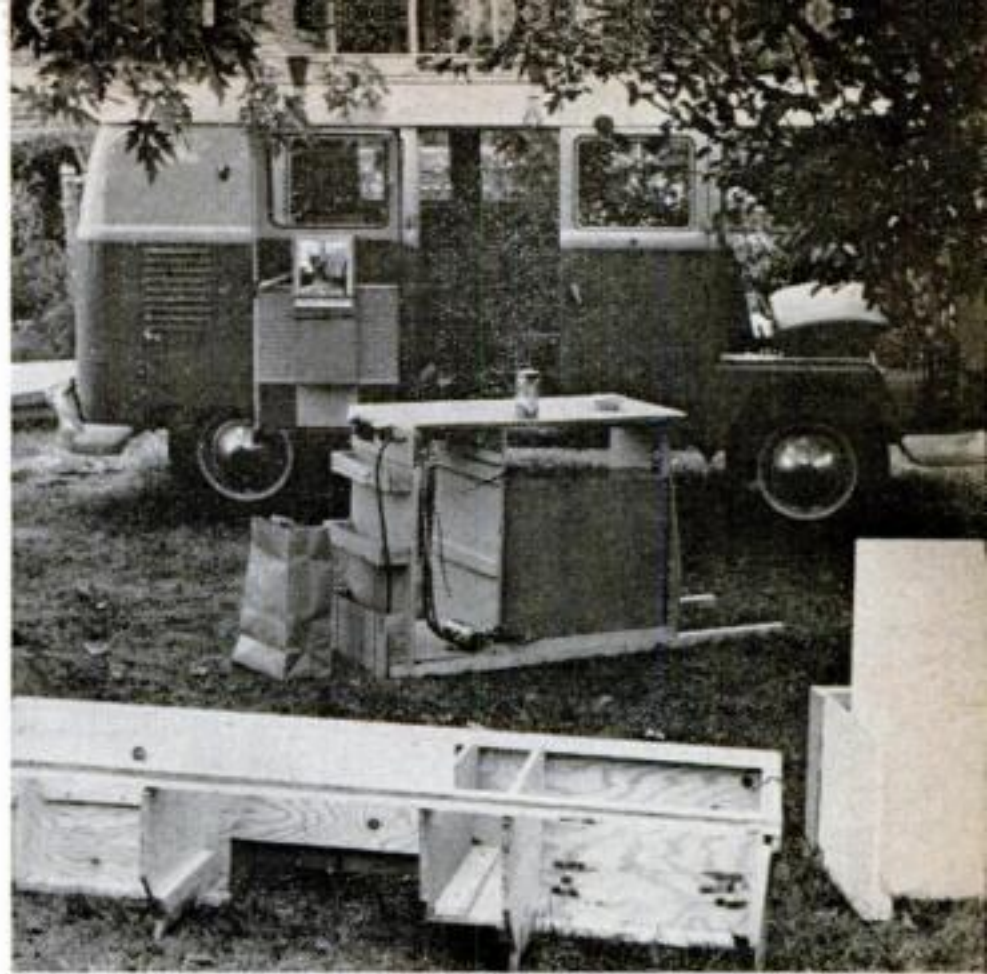


This rig sleeps four—two adults lengthwise on double bed and two kids crosswise, one on floor, other on front seat.

WHAT do you do when you want both a mobile camper and a regular station wagon for family use between vacation trips? Phil Geraci of Hyattsville, Md., solved the problem by converting a Volkswagen Microbus so it can be used either way.

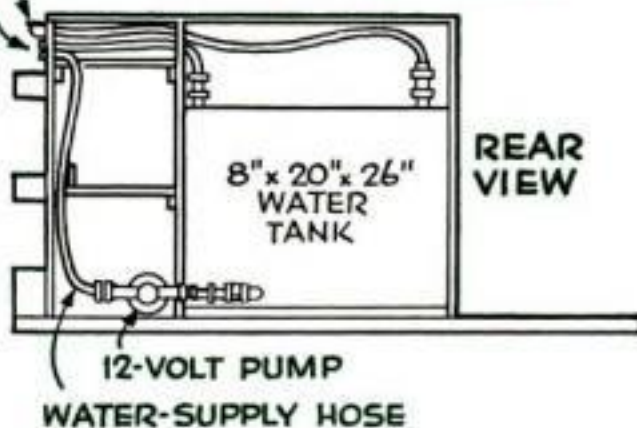
The VW's easily removed seats make the switch a snap. They lift out in a few

CONTINUED



All camping units are quickly removable. Portable kitchen, shown here, contains water tank, pump, a slide-out work table, and shelves for canned goods and utensils.

AUXILLIARY FILLER WITH GARDEN-HOSE CONNECTION
FILLER HOSE WITH TRAILER-TYPE FILLER FITTING



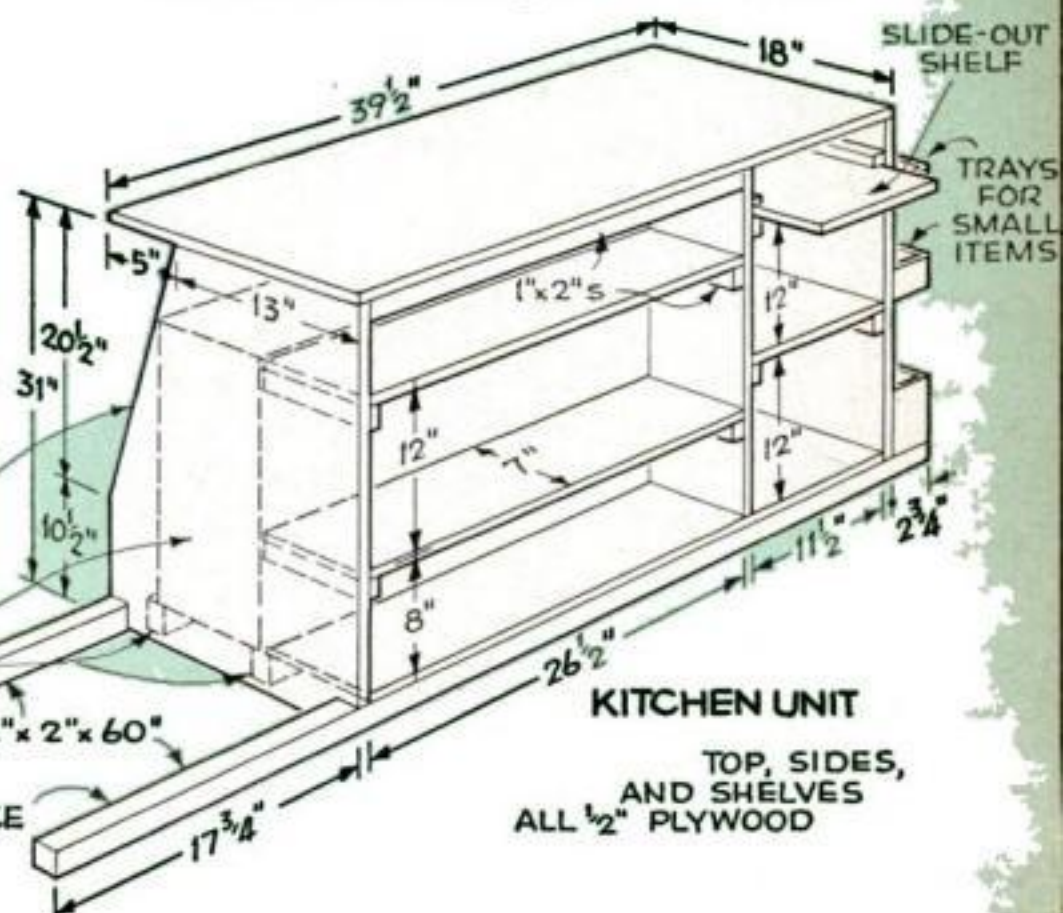
12-VOLT PUMP
WATER-SUPPLY HOSE

LEFT SIDE CUT ON SLANT TO CLEAR

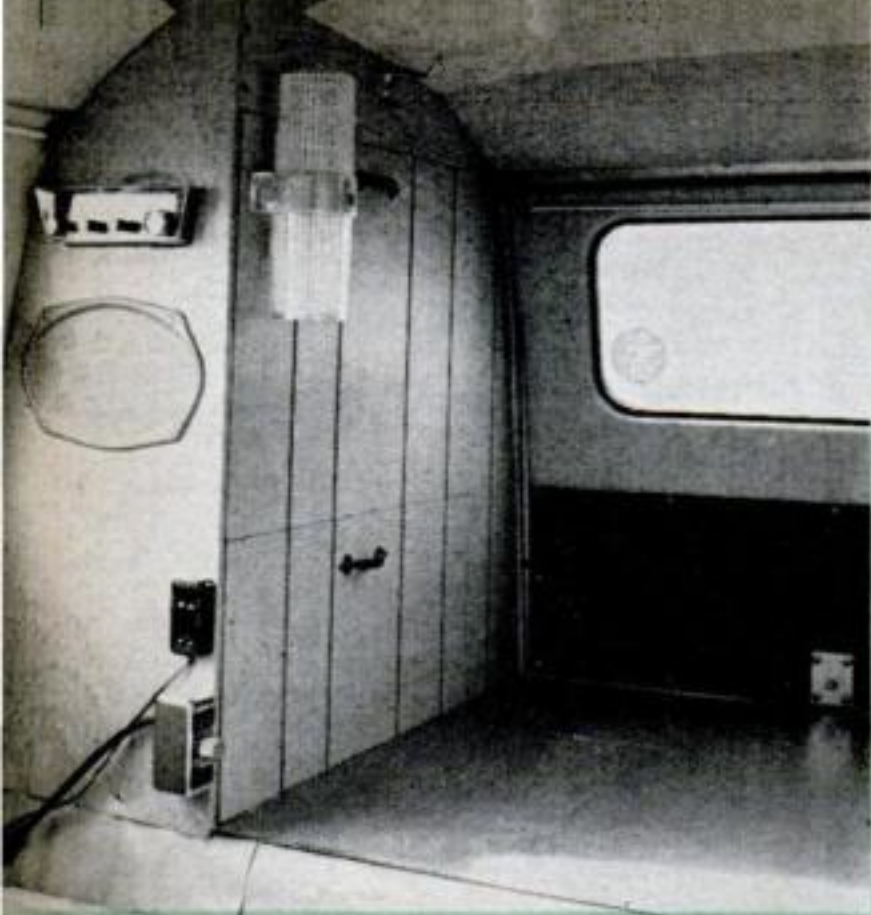
WATER TANK INSIDE

TANK RESTS ON 2"x3"s

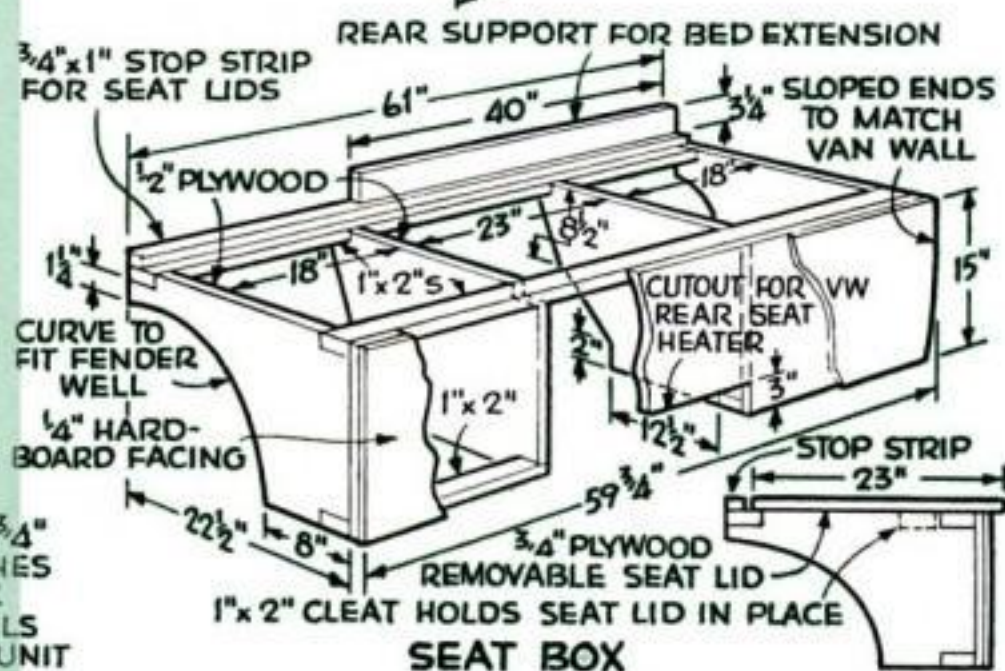
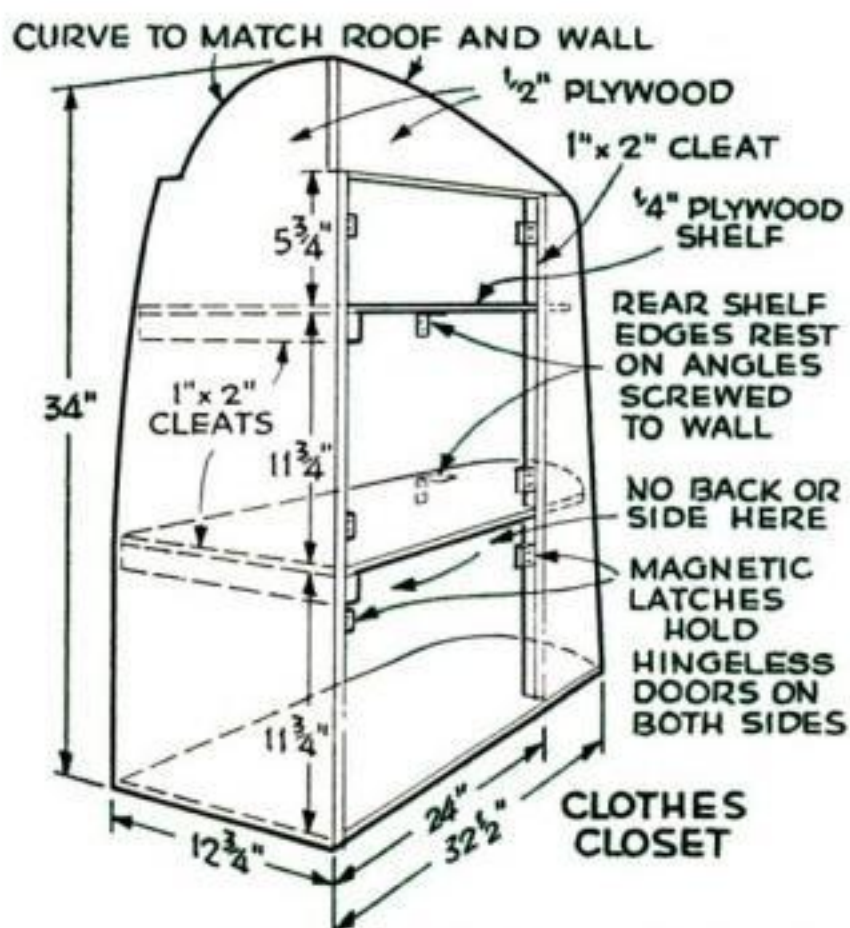
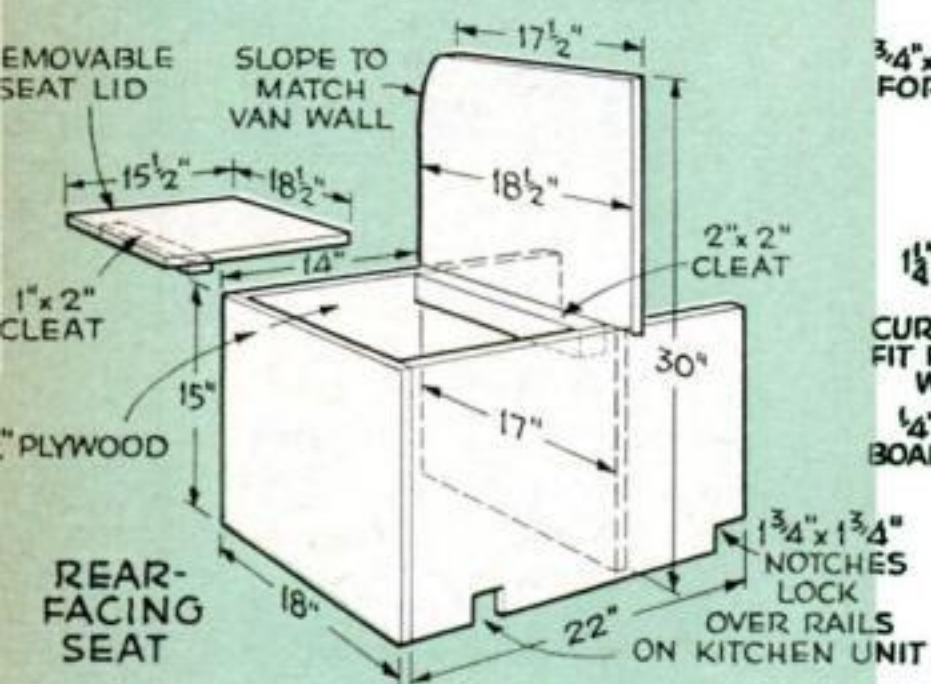
RAILS EXTEND TO LOCK SEAT IN PLACE



KITCHEN UNIT
TOP, SIDES, AND SHELVES
ALL 1/2\"/>



Clothes closet hugs rear corner of van as if it grew there, yet lifts right out. Cardboard scraps were trimmed to match the contours of the van, then used as templates to cut the close-fitting curves.



minutes. In their place go four self-contained units that provide complete living facilities for a family of four: beds, a portable kitchen with running water, a full-width seat box that doubles as a storage bin, a smaller separate seat, and a ceiling-height clothes closet.

For a table, the Geracis use a simple piece of plywood fitted with screw-on legs. It can be set up either inside or outside depending on the weather, and can be collapsed at night by removing the legs to make room for a double bed. The bed, big enough for two grownups, consists of two 4"-thick foam-rubber cushions set up on the rear cargo deck and extending partly out over the seat box. One youngster sleeps crosswise under the raised end of the bed, while a second one bunks up in the van's driving compartment.

The furniture units are designed to hug

the van's interior contours for a trim, built-in look. Yet they lift out in minutes when it's time to convert the camper back to regular transportation. Most of them fit so snugly that no fastening is necessary. Two rails on the bottom of the kitchen unit extend across the van, wedging the unit between the walls. Notches in the bottom of the small, rear-facing front seat hook over these rails, locking the seat in place. Only the closet needs a few bolts to fasten the rear edges of its shelves to angle brackets screwed to the van's walls.

To run the camper's electrical appliances, Geraci rigged up the unique power-supply system shown on the facing page. It operates, among other things, a complete hi-fi system mounted in the clothes closet. The same supply also runs a 12-volt water pump mounted in the kitchen unit. This pumps

[Continued on page 206]

How to get more electricity for a camper's accessories

MOBILE campers have one bad habit: They eat up electric power in huge gulps. There are lights, fans, refrigerators, pumps, radios, electric shavers, and probably a woman's hair dryer. For Phil Geraci, who built the VW camper shown here, there was an added problem: The VW uses a six-volt system that won't feed the new 12-volt accessories. The Geracis also wished they could take along household appliances requiring 110 volts.

Geraci's idea: Why not install a separate power supply that would provide any type of electricity desired? The rig he devised can be used in any mobile camper to provide almost unlimited electric power.

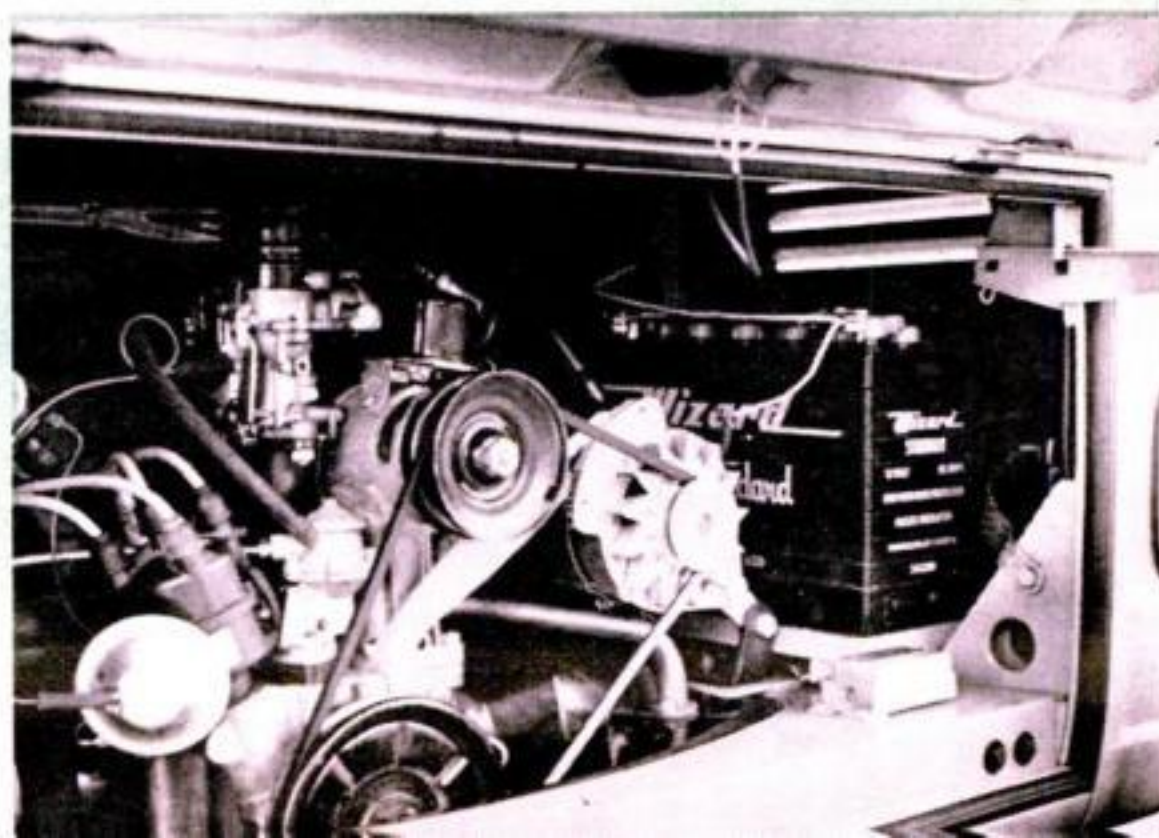
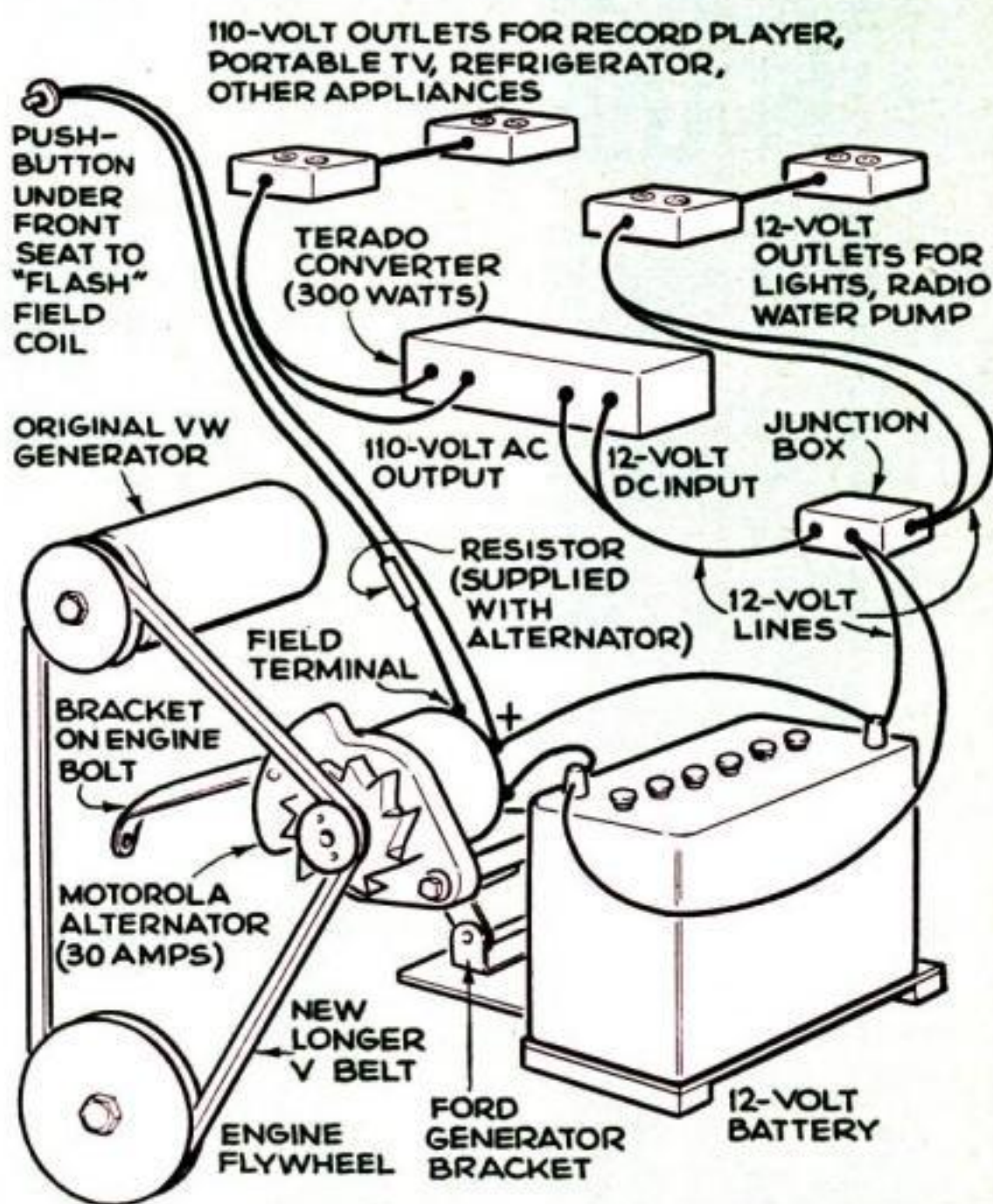
The answer proved to be one of the new alternators that produce electricity even at a slow engine idle. Geraci chose a 30-amp Motorola and mounted it next to the engine so it's driven by the same belt that drives the VW generator. A new, longer belt did the trick here.

The alternator feeds a new 12-volt battery, keeping it charged. One pair of leads runs from the battery to a string of outlets that handle all of the 12-volt appliances. A second pair of leads runs to a 300-watt Terado converter that changes the 12-volt DC current into 110 volts AC. This, in turn, feeds a second string of outlets that handle all of the 110-volt appliances.

Result: Plug in anything you want—even the home TV set—and there's plenty of power to run it. One daytime charge provides all-evening power with the engine shut off. With the engine running, you can draw the full 30 amps directly from the alternator for high-drain equipment such as power tools.

The alternator requires a momentary shot of current to

magnetize the field and start the charging. For this, Geraci rigged up a pushbutton under the front seat. The alternator itself fits conveniently into a Ford generator bracket bolted to the chassis. The original six-volt system is left intact to take care of the van's own needs. With this setup, there's no risk of running down the engine's battery when you want to stay up late to watch television.



PIGGYBACK CAMPERS

a kit cuts the cost



Do-it yourself camper kit fits many popular pickups. Inside can be finished with bunks and plywood. It's made by MacDonald Camper Kit Co., El Monte, Calif.



Aluminum sheathing is rolled down over pre-finished metal frame and trimmed to size. Manufacturer claims two men using ordinary tools can assemble the camper in one day.

THE once-lowly truck-mounted camper is getting the glamour treatment. More room, fancy interior trim, and more efficient kitchen and bathroom facilities are the order of the day.

Advantages over house trailers? Plenty. Camper-equipped vehicles handle better on the road. Your wife can cook while you drive (most states forbid riders in trailers while they're in motion). You can travel on roads that restrict trailers. And campers are far cheaper than motor homes.

Two types of campers are available: slip-on and chassis-mounted. The former can be removed when you need the pickup for everyday duties. But the permanently mounted units seem to be more popular. They're roomier, and offer bathroom facilities not usually found in slip-ons.

If you're on a tight budget, build your own camper. You can buy the kit pictured on this page for as little as \$185.

There are also many ready-built units to choose from. One of the most unusual has a glass rear wall with a sliding door. It gives an open,



Want a "Silent Partner"?

—the "FISHERMAN" is as close as you'll come

We've had only one complaint.

The 5½ hp "Fisherman" is so quiet you sometimes forget it's running.

Customers have been known to pull the starter handle after the motor has started.

Not that it hurts anything. You just feel a little foolish.

On the other hand, it demonstrates to your fishing companion what a sweet running motor it is. You can go on from there to demonstrate how smooth it is. How it'll tick along at a snail's pace without a cough or a quiver.

Its smoothness is due partly to its perfect combustion. Which in turn results from its thermostat-controlled cooling-heating system. Partly from its cushioned power-head which "floats" on rubber mounts.

Both have a lot to do with its quiet. But not everything. What noise we couldn't absorb, filter out, or bury in the wake, we bottled up in a sound-sealed cover.

We've applied the same principles to our big motors with some pretty startling results.

It may not make a bit of difference to the fish.

But it will to you.

Get the full story. Send for free catalog. Write Evinrude Motors, 4098 N. 27th St., Milwaukee 16, Wis. Div. of Outboard Marine Corp.

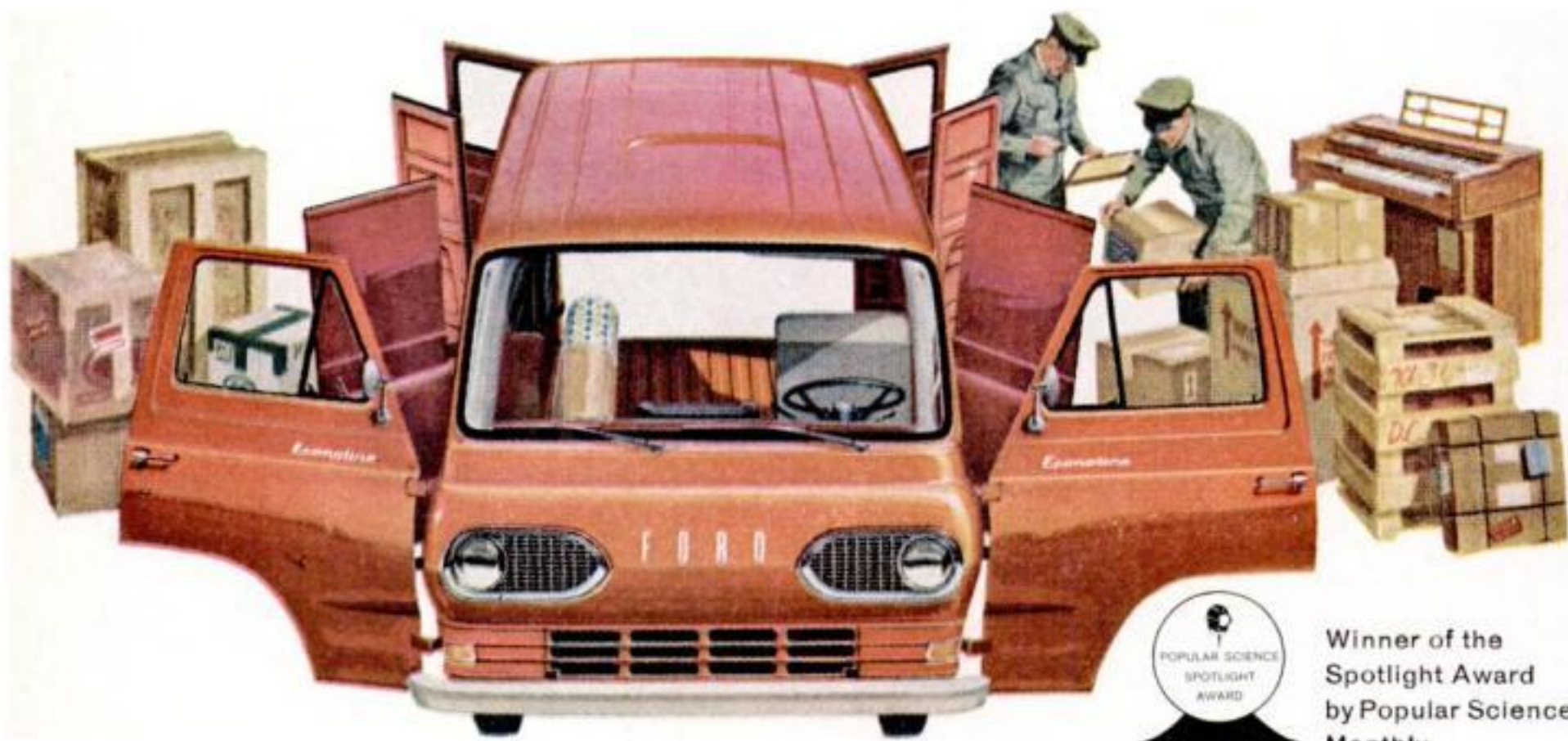


EVINRUDE

FIRST IN OUTBOARDS

Copyrighted material

WHY BUY AN ORDINARY PANEL WHEN YOU CAN GET...



Winner of the
Spotlight Award
by Popular Science
Monthly

More loadspace...more loading ease...

Econoline offers 204 cu. ft. of loadspace; a low floor flat from front to rear ...no rear engine hump to hamper load-

ing. And big 4-ft. doors at rear and sides (left side optional) put all the load within easy reach for fast unloading!



More driving ease..

Huge windshield gives superb visibility! Over-all length is 2 ft. less for quicker turning, easier handling.

More miles per gallon...

30% more! Certified tests show Ford's Econoline Van can go as far on 3 gallons of gas as old-style panels go on 4!



FOR \$126 TO \$394 LESS!*

Econoline saves work, saves time, saves trips, yet is priced \$126 to \$394 less than old-style 1/2-ton panels! Savings in operating costs can total \$100 yearly!

*Based on comparison of manufacturers' suggested retail prices for standard-equipped vehicles

FOR 60 YEARS THE SYMBOL OF DEPENDABLE PRODUCTS

 MOTOR COMPANY

1963 FORD ECONOLINE VAN



Slide out the 3'-by-6' porch on the Robin Bel-Air shown above and relax. Rollers are cadmium-plated to prevent corrosion. Rear wall is safety glass. Approximate price: \$3,000.

airy feeling, says Robin Mfg. Co., Culver City, Calif. Their Bel-Air unit is 10½' long, 7½' wide. It slips on a ¾-ton truck or bolts to a trailer chassis. It has a full bathroom plus outlets for appliances when 110-volt current is available.

The Sportster Challenger (\$3,995) is the hottest model made by Roll-Along of South El Monte, Calif. Price includes frame lengthening. There's a walk-through opening between cab and camper, and the cab has swivel seats. The 22'-long, 8'-wide unit mounts permanently on a ¾-ton truck. It sleeps four, and has wood paneling, flush toilet, six-cubic-foot refrigerator, and oven.

The wheelbases of most ¾-ton trucks must be extended about a foot to accommodate the 12' Safari. This camper also comes in 10' and 14' lengths—the latter requiring wheelbase lengthening of about 3'. All are 7½' wide.

Features include a side entrance, butane-electric refrigerator, and sleeping accommodations for four. Prices range from \$1,795 to \$1,995, plus \$445 for a full bathroom with shower and hot water. The manufacturer: Coons Custom Coach of Pomona, Calif.

Looking for a slip-on unit for a half-ton truck? Tear Drop of South El Monte makes one. Their

PIGGYBACK CAMPERS

3 you can even buy one with a back porch



Frame must be modified to accept 1,500-pound Coons Safari camper. A double bed perches over the truck cab; dinette divans in the rear of the camper convert into second double bed.



Wind resistance is reduced by V-shaped front window of McNamee's Kamp King. Foam-rubber insulation—claimed to keep interior temperatures comfortable more efficiently than other materials—is new. Prices start at \$1,545.

CONTINUED



Roll-along camper has swivel seats. Passageway to cab is closed with an accordion-type door. A six-cubic-foot gas-electric refrigerator and safety-glass windows are standard equipment. A full-width tubular container below the rear bumper conveniently holds the sewer hose for use in trailer parks. \$3,995.

big model is an 8½'-wide unit that sleeps four to six. An insulated icebox and a butane stove are standard equipment. Price: \$1,295.

Most slip-ons don't have toilets. However, the Super De Luxe Kamp King, made by McNamee Coach Corp. of South El Monte, has one. Though the firm makes campers up to 10½' in basic length, their 8½' model (12½' including over-cab section) is the big favorite. All fit ¾-ton trucks.

Both Montgomery Ward and Sears sell knocked-down campers to fit most pickups. Prices start at \$249 and \$364 respectively, less bunks and curtains. Installation is claimed to take two hours.

The smallest, cheapest camper? It's made by Huntsman Co., Pomona, Calif. The price of the louvered-windowed unit has been reduced to \$220. It can be mounted even on compact pickups. But you have to outfit the interior yourself. ■ ■



Foam-padded beds mount in tented "wings" at sides of Scout Camper by International Harvester. Deluxe model (\$1,850, factory installed)

has a dinette set, stand-up galley, and a screened chemical toilet that retracts into the wall. Standard, stripped-down unit costs \$960 installed.

A PIGGYBACK CAMPER

you can
make yourself



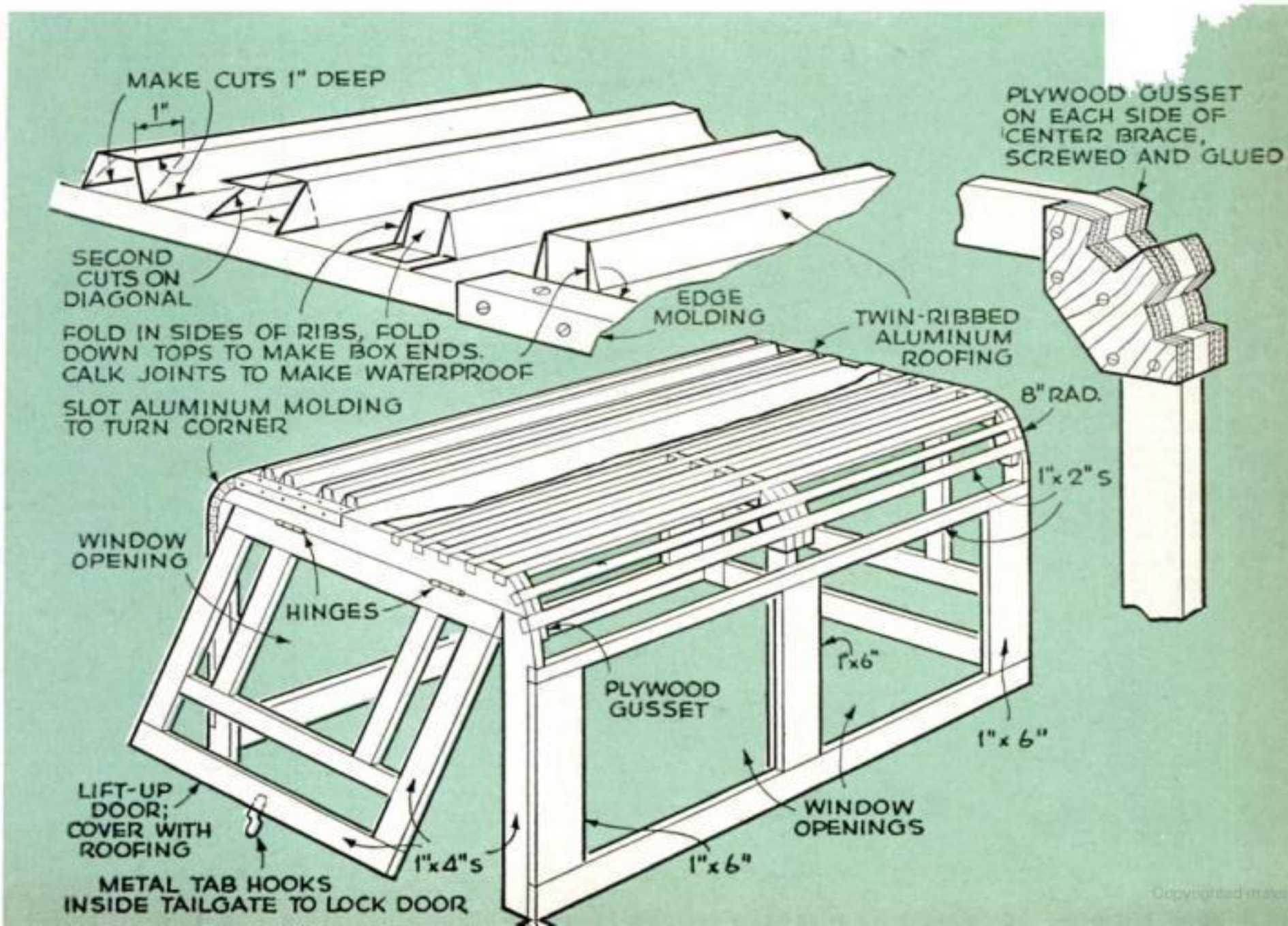
FOR simplicity, this homemade canopy for a pickup takes first prize. Made of twin-ribbed aluminum roofing over a light wood frame, it cost its builder, Earl Cochran of Colorado Springs, just \$50. Inside, there's space for one folding cot or two sleeping bags, plus a stove, water jug, food, and other supplies.

Any metal roofing could be used, but the twin-ribbed type is especially handsome. The only tricky part is finishing off the edges. Note in the drawing below how the ribs are cut and bent to form neat, closed-in ends. These are fastened with aluminum-angle strips screwed down over

all corner joints. The roofing needs no additional fastening, thus avoiding nailholes at intermediate points that might cause leaks.

The canopy is bolted to the truck body with metal angles. Its size will depend on the type of pickup you have. Cochran's required three 4'-by-7' sheets of roofing for the top and sides and one 4'-by-10' sheet for the ends. Total cost: about \$20.

Cochran used small stock windows that come complete with glass and sash. The fixed-glass type are cheapest, but for ventilation you can also get combination units that include screens.



CAR-TOP SLEEPERS

one you
can build

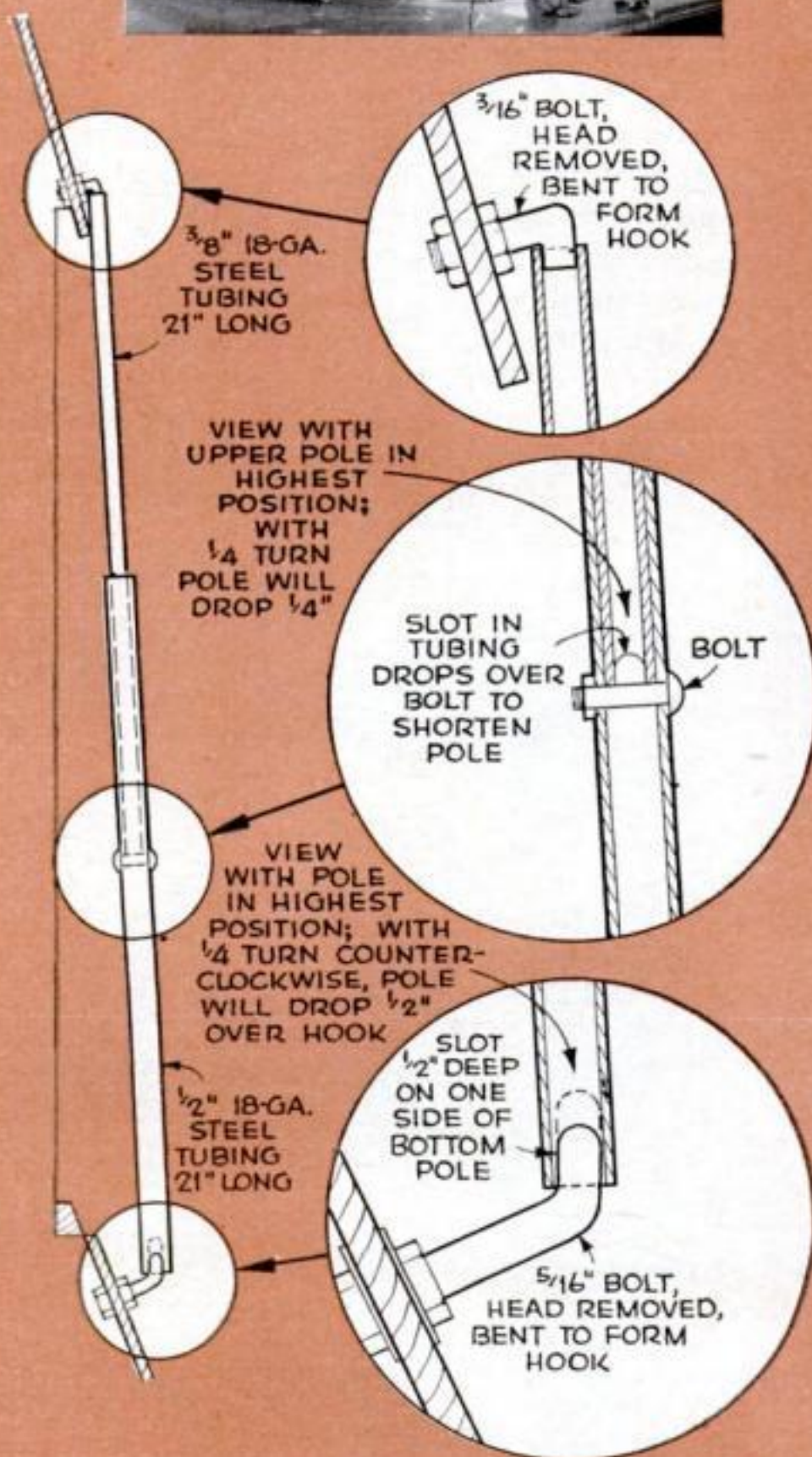
BY DAY, all that shows on the roof of your car is a slim, streamlined box with the graceful teardrop shape of an airplane wing. At night, you prop up the box lid and—presto—there's a weather-tight canvas enclosure large enough to house a double bunk, all made up and ready for sleeping.

The big charm of a roof-top rig is that you can fit one to any car and take it off and store it between trips. With Mom and Dad topside and two kids on the car's regular seats, this simple arrangement can sleep a family of four.

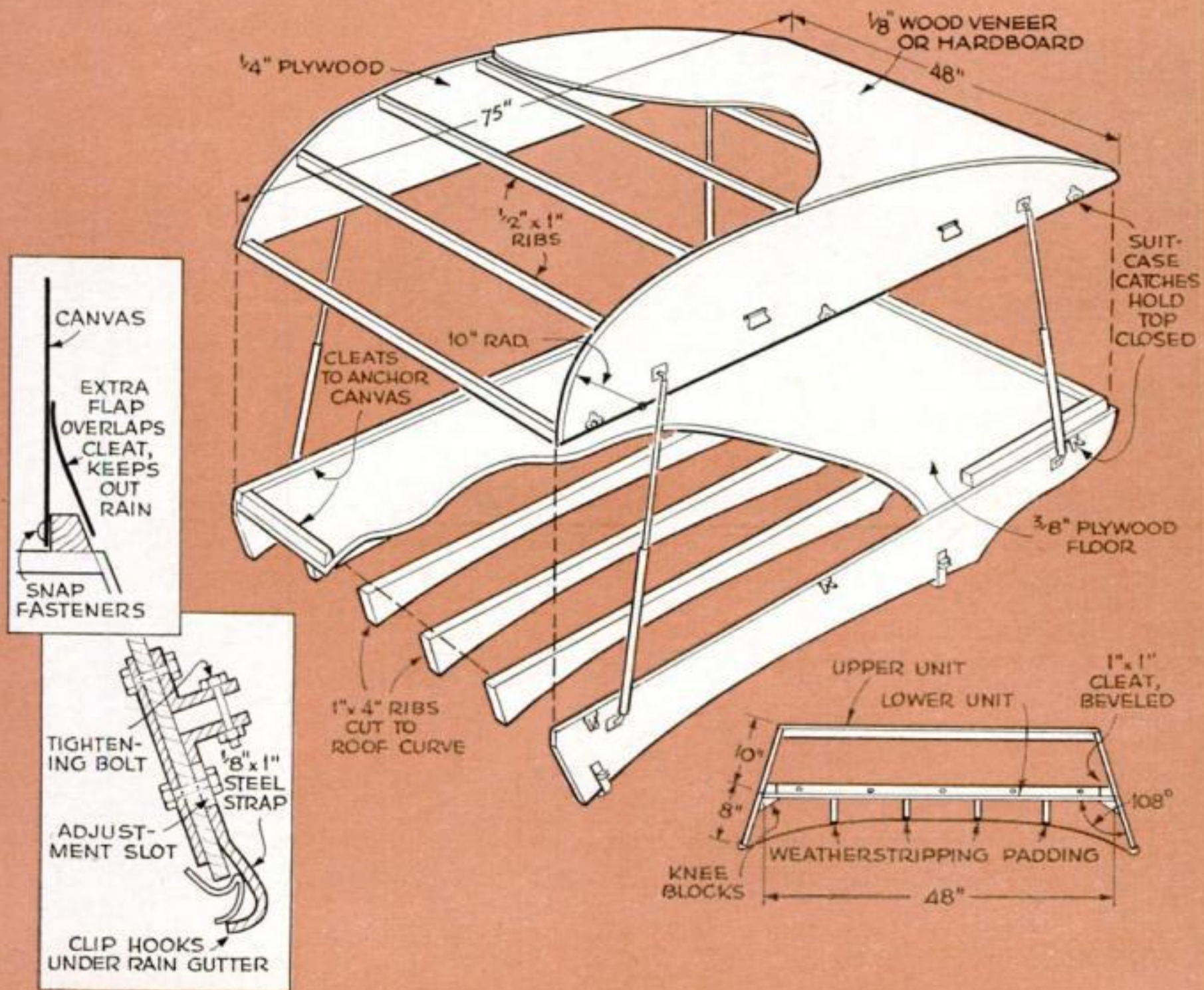
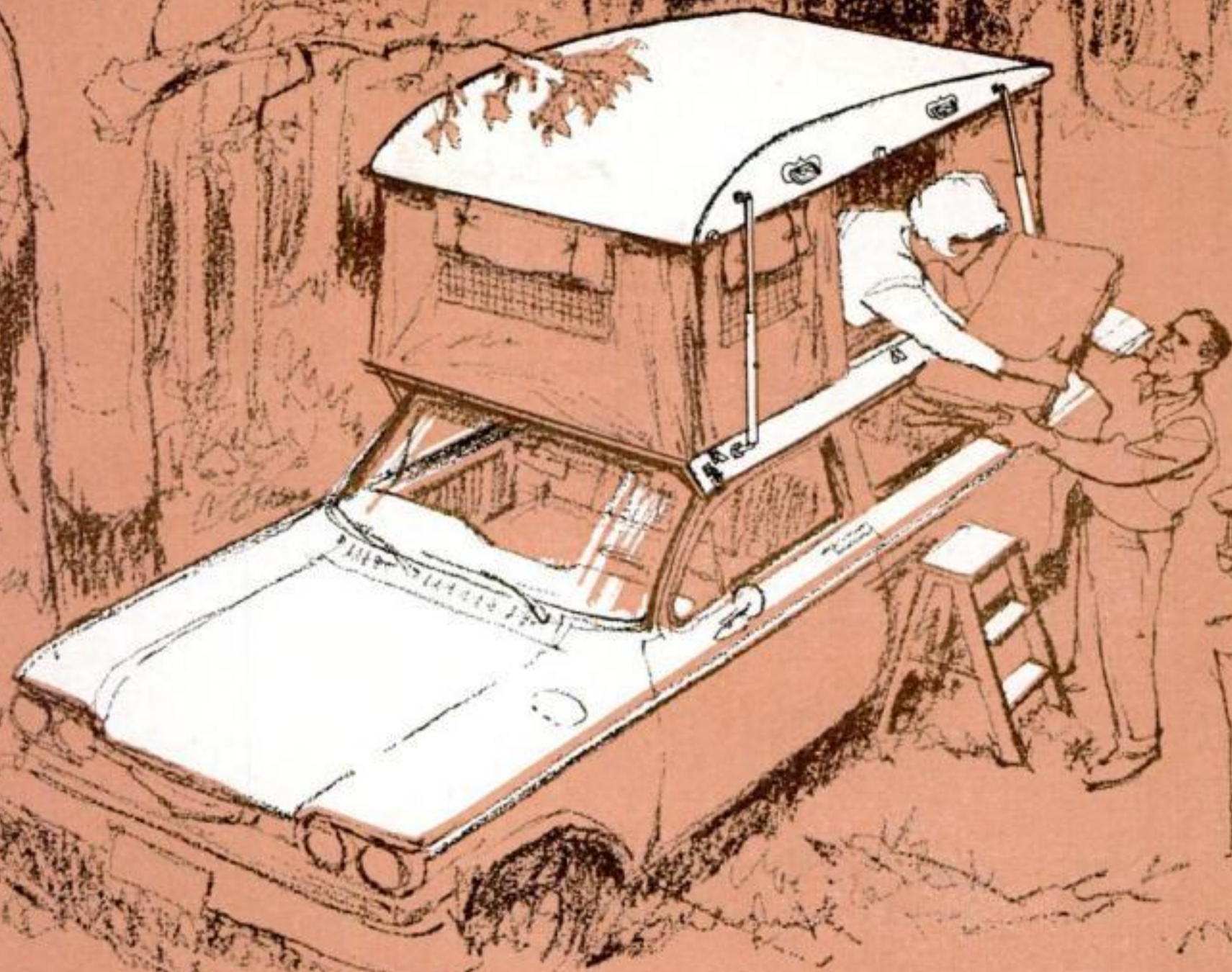
Car-top sleepers are available commercially in several types, but you can also make one yourself. The rig shown here, built by E. D. Lindblad of Norwalk, Calif., cost less than \$50. The bottom half is just a plywood platform supported on ribs shaped to the roof's contours. Two outer side rails rest directly on the rain gutters, taking most of the weight off the roof proper. With the top removed completely, the platform can double as a general-purpose load carrier.

Exact dimensions will depend on the car, but even a small roof can support a full-length bed if you let the rear end overhang slightly, as here. A length of 75" takes a standard-size air mattress comfortably, and you can leave the mattress inflated when the top is closed. Clips, made of steel strap, anchor the sleeper to the roof.

[Continued on page 204]



Notches filed in ends of telescoping tubes drop over pins, letting tubes retract slightly so you can slip them over lower hooks. A quarter turn then expands tubes to tauten canvas.



STATION-WAGON TENTS

5 they
hitch a home
to your tailgate



You add 81 square feet of extra living space with this 9'-by-9' extension (left). This and other Montgomery Ward models all have sewn-in canvas floors, are 7' high at the peak. Frame is free-standing, does not depend on car for support. Connecting hood from tailgate to tent is held in place with elastic ties.

For quickie stops, you can add a sleeping porch

If you don't need a full-size tent, here's a simple canvas enclosure that adds usable living space inside the wagon itself. As shown at right, it slips quickly over the opened rear end, turning your tailgate into a cozy bedroom. You can sleep in the rear

without having to collapse the wagon's seats.

A hooded mosquito-net window gives bug-free ventilation even in a downpour. Karpak Co., Roanoke Bldg., Minneapolis, sells the enclosure for \$26.95.

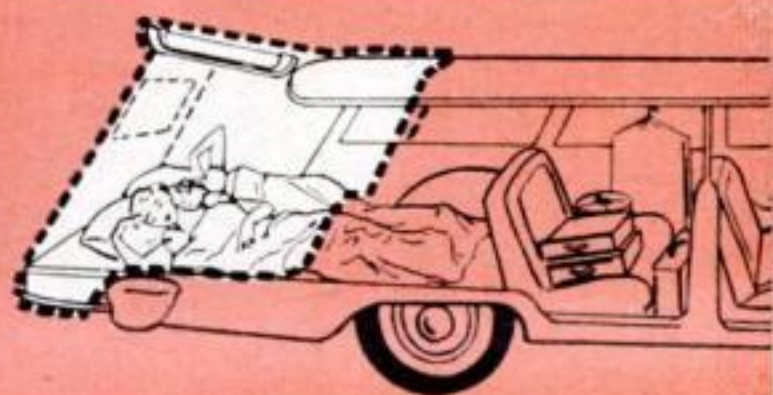


EVER wish you could camp right in your station wagon, yet have plenty of space for eating and sleeping in comfort? Here's a new breed of camp tents designed for just that. Back your wagon into a hooded opening on one side and you have a snug-fitting extension big enough to sleep from four to six persons.

There's no unloading your wagon at each night's stop—food, cooking equipment, and bedding are brought right into the tent intact. Your tailgate becomes a handy table. When you want to run into town for supplies, you just roll the wagon away and close the opening with a flap.

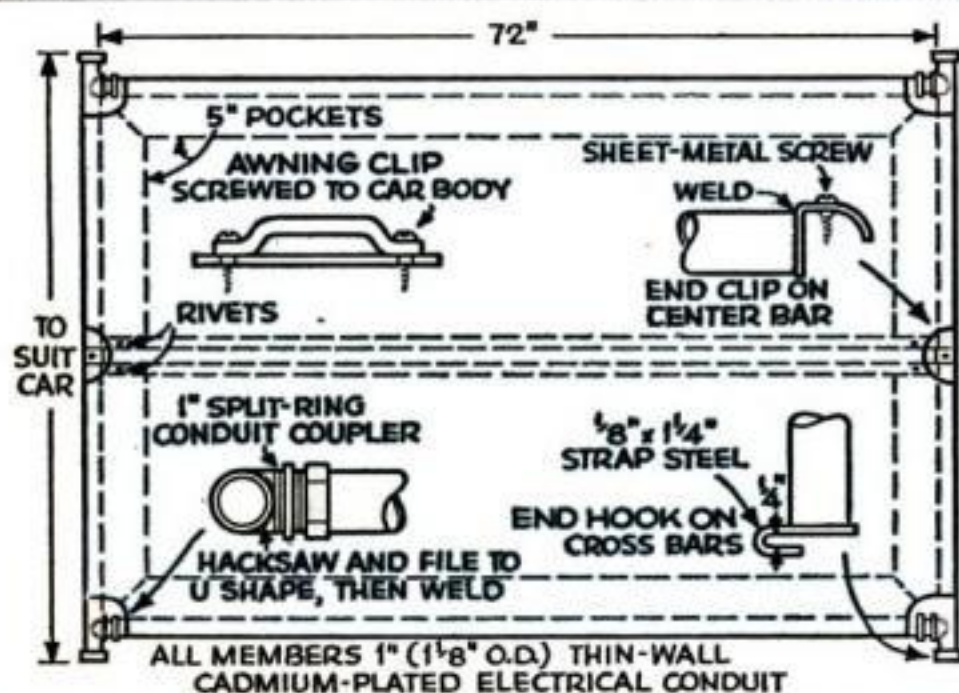
The tents come in two styles, the teepee type above and the straight-sided one on the facing page. Another innovation: The aluminum-tube frame goes on the outside, and the tent hangs below it. This makes setting up a breeze, ends fumbling inside with poles, and prolongs tent life by eliminating abrasion against the frame.

The tents shown are available from Montgomery Ward. Prices range from \$87.50 for a 7'-by-9' size to \$109.50 for a big 11'-square model. Similar tents are sold by Sears, Roebuck, Ames Harris Neville Co., and others. You can also get conventional tents with inside-out frames.





UPPER BERTH for a station wagon



Double bed hooks quickly into awning clips fastened to the wagon's window molding with self-tapping screws. If this puts the bed too low to clear the front seat, shift it farther back so it mounts behind the seat.

SLEEPING in a station wagon is a fine way to camp, but often it's done the hard way. You unload all your gear each night to make bed space, then repack it each dawn.

This didn't make sense to E. F. Lindsley of Troy Center, Wis., so he fashioned an upper berth out of a simple canvas rack. The berth sleeps two adults comfortably without disturbing gear stowed beneath it. On the road, it rolls up neatly out of the way.

Electrical conduit makes a lightweight frame for the canvas. The two crossbars have clips welded at the ends. These hook into awning clips screwed to the wagon's metal window molding. On Lindsley's Jeep, the windows are high enough to let the bed extend forward over the front seat. On lower wagons, the bed can be located just behind the seat.

Standard conduit couplings welded to the crossbars make it easy to assemble the frame. To collapse the bed, the three lengthwise poles are detached and slipped out of the canvas pockets, and the canvas is rolled up.



And here are
**Two
 Extra
 Ways
 to
 Vacation
 on
 Wheels**

TRAVEL TRAILERS

Sales of the ever-popular travel trailer have almost doubled in the past five years. Last year alone, more than 58,000 were made. Their big appeal: They give you roomy, comfortable living quarters, yet can be unhitched in minutes. Average price is about \$1,800. Typical of the many new models out this year is the trim Trotwood above.

MOTOR HOMES

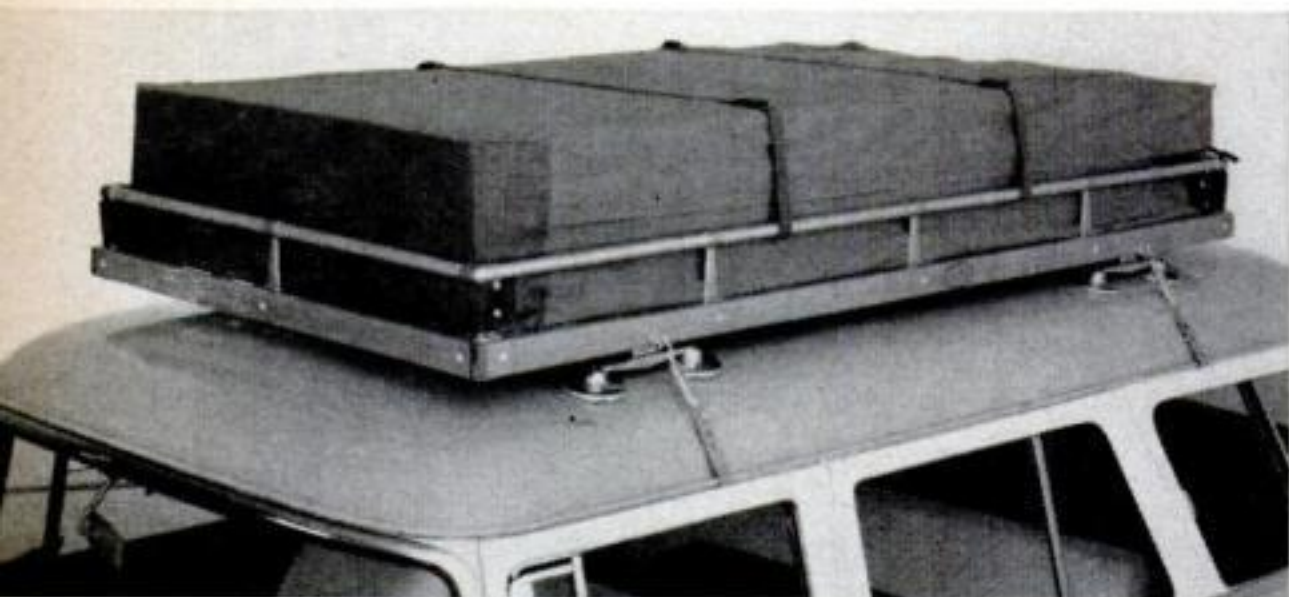
One of the newest trends in on-the-road camping is the luxurious motor home—literally a house on wheels. Road-tested by PS in January [see "Coast to Coast in a Dodge Motor Home"], this type of camper offers full living facilities for four or five.

Shown here are two of the latest, the Traville (top) and Clark Equipment Co.'s Cortez (bottom). Prices are \$7,980 for the Traville and \$7,985 for the Cortez.





A lockable zipper protects your camping supplies in this weathertight enclosure. A collapsible inner frame lets you fold the carrier flat for storage. Market Forge Co., 35 Garvey St., Everett, Mass., makes three sizes for about \$37 to \$50.



This jumbo-size carrier is big enough to double as an upper berth for two. It comes in four lengths from 4' to 90". Prices range from \$48 to \$125 from Carter Mfg. Co., 1235 S. E. Division St., Portland, Ore. Luggage covers are extra.



CAR-TOP CARRIERS

they add a trunkful of space on the roof

OFTEN, although you don't need a fully outfitted camper, you do need extra stowage space to pack along all the gear that a vacation trip calls for. One good way to double your trunk space is to put your roof to work.

Modern car-top carriers are designed to do just this. They not only anchor a load snugly topside, but many newer types also provide a weathertight enclosure to keep your supplies dry and protected.

Most auto makers supply roof carriers made especially to fit their own cars—a point that may not be generally known. Independent makers also provide a wide variety to choose from. Shown here and on the next page are some of the types available for your camping needs.

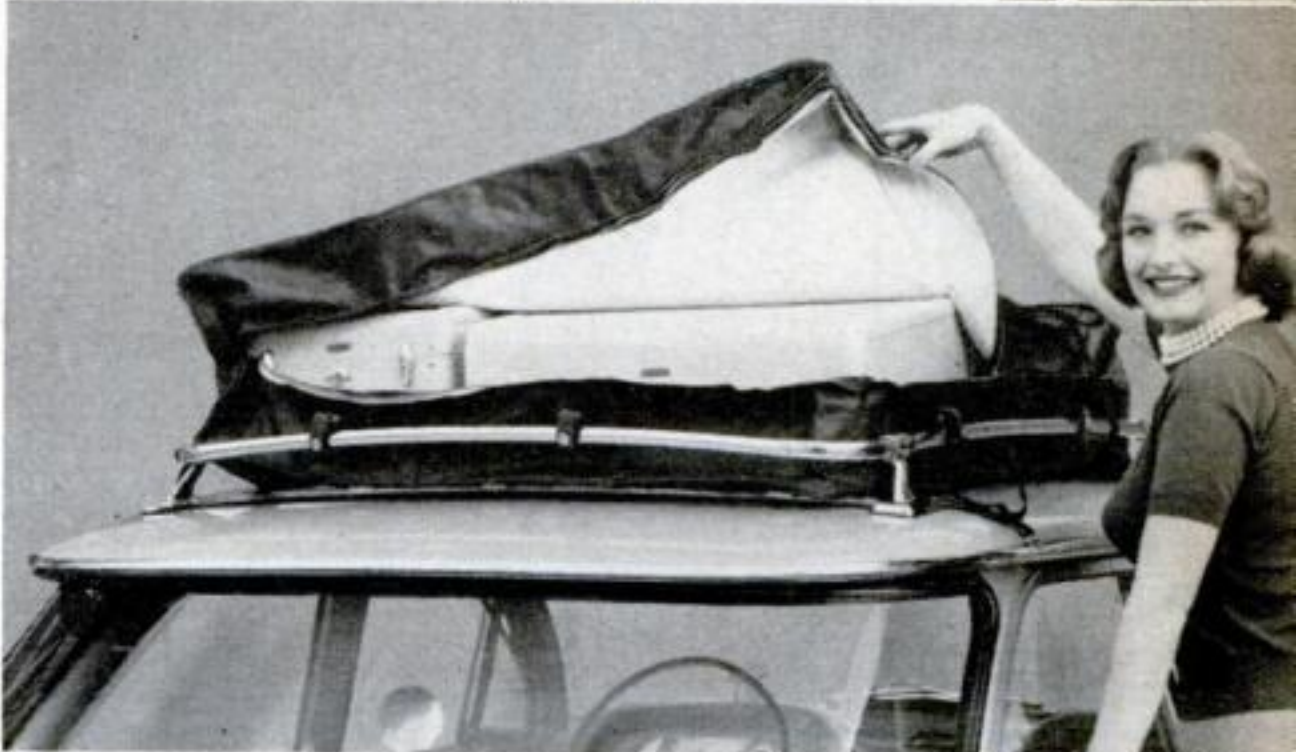
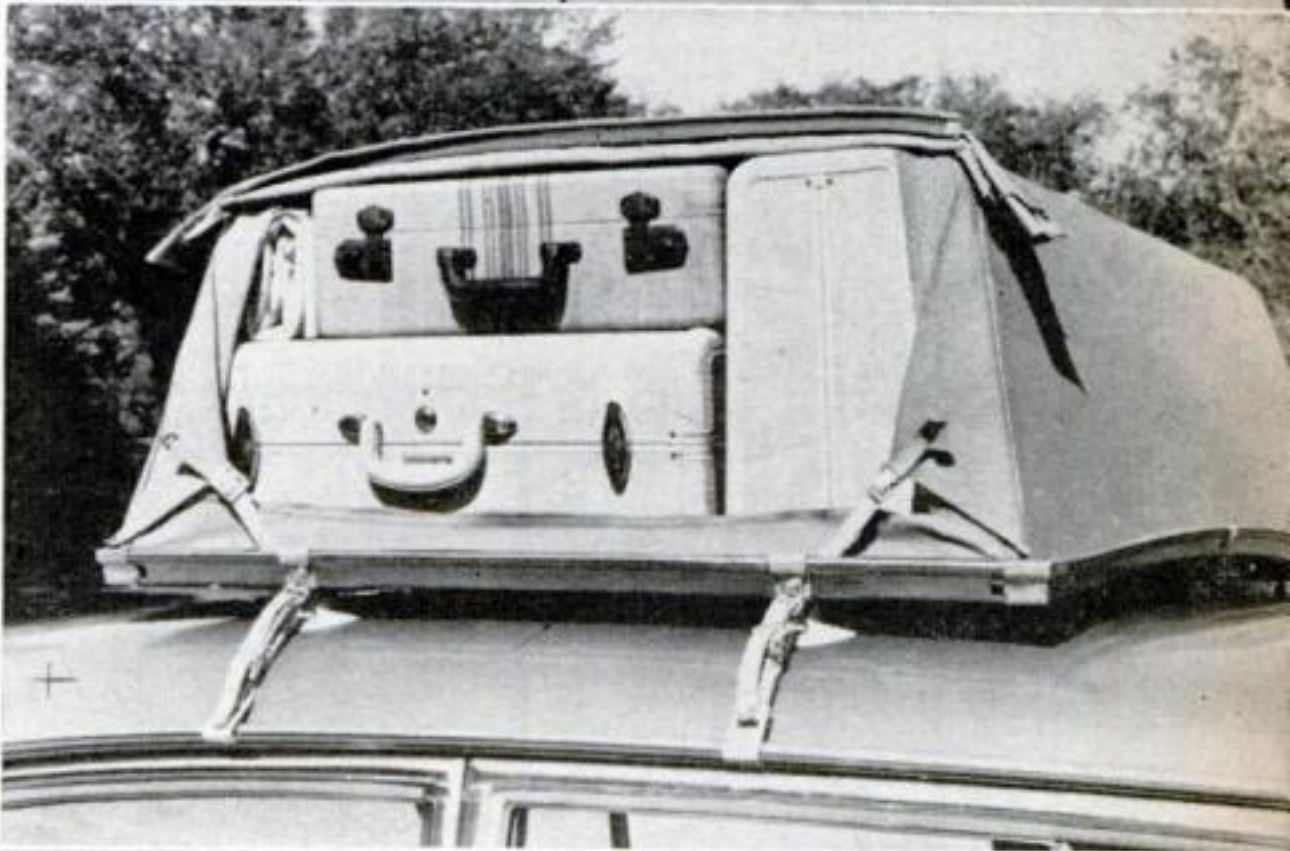
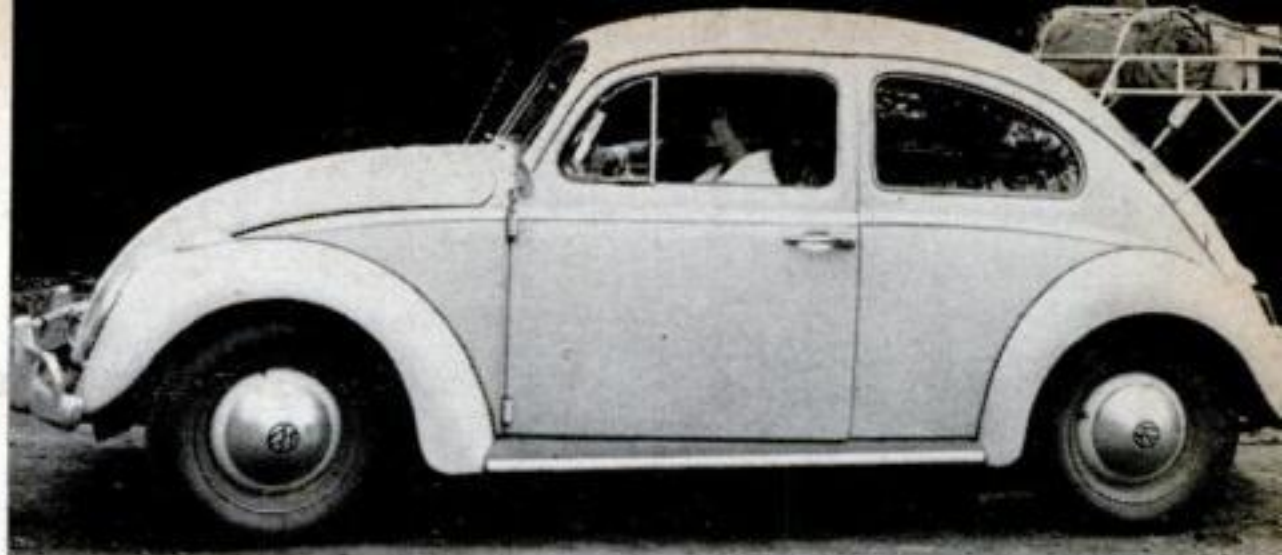
Made of rigid fiber-glass, this hinged canopy is designed for rugged use. It's 4' wide by 54" long, giving 20 cubic feet of stowage. A seal around the edge keeps out rain and dust. With the canopy removed, the rack serves as a flatbed hauler. It's made by La-Cal Automotive Co., 701 Gibbons St., Los Angeles. Price is \$99.50.

This bustle-back carrier, made especially for the VW, minimizes mileage-robbing wind resistance, is said to improve stability, like a tail fin. It clamps to the gutters, holds 125 pounds directly over the rear wheels. Nicholson Mfg. Co., 318 G St., Davis, Calif., sells the carrier for \$29.95. It's also available through Volkswagen dealers.

Sleek and streamlined, this sealed aluminum carrier is designed to keep camping supplies dry in the heaviest downpour. The side hatch locks with a key. The racks can be used separately without the carrier for a boat, lumber, other loads. A 5' model sells for about \$110, a 6' model for \$120. They're made by Space Van, Inc., Box 104, Marshalltown, Iowa.

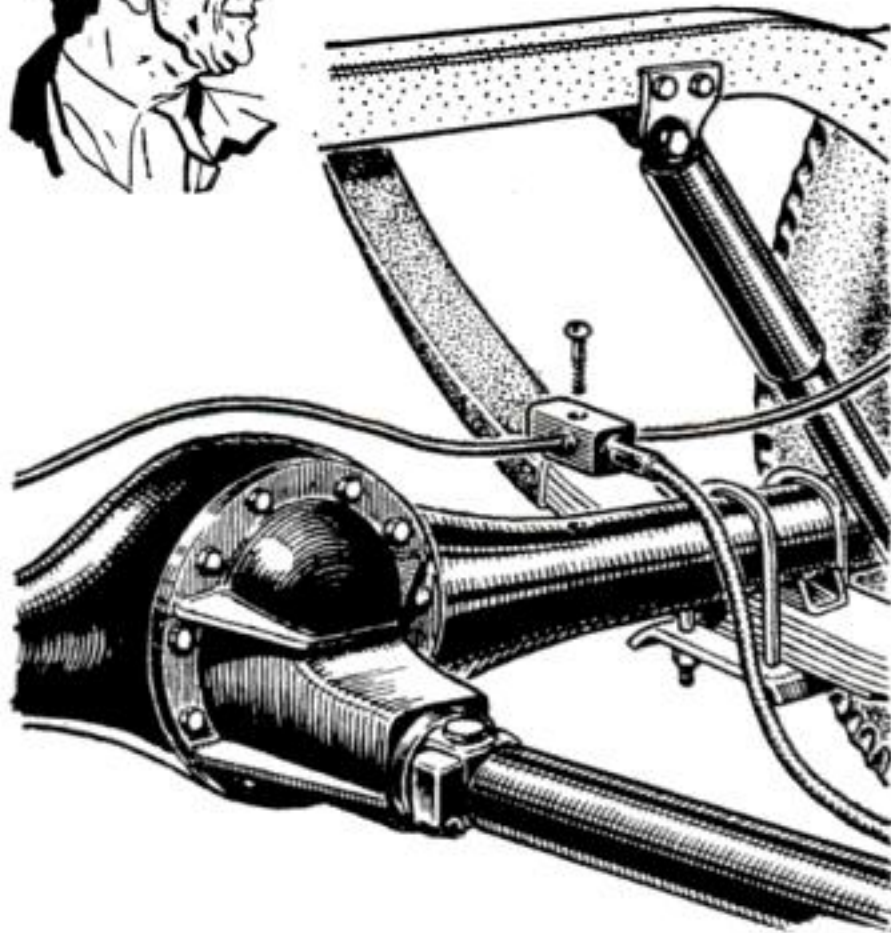
All the luggage that would normally fit in your trunk packs neatly into this weatherproof vinyl canopy. The flexible covering retains its shape when empty so you can load it easily, yet it can be folded flat when not in use. The zippered side flap can be locked with a padlock. The carrier comes in four lengths from 3' to 6', giving 12 to 24 cubic feet of stowage space. Prices run from about \$38 to \$60 from Karpak Co., Roanoke Bldg., Minneapolis.

This snap-in bag fits inside a standard roof rack and converts it to a fully enclosed weather-tight carrier. When the rack is wanted for other hauling, the bag can be unsnapped and lifted off. One shown here is made to fit Chevy racks and is available through Chevy dealers. Similar bags are made for many other makes of cars.





Hints from the Model Garage

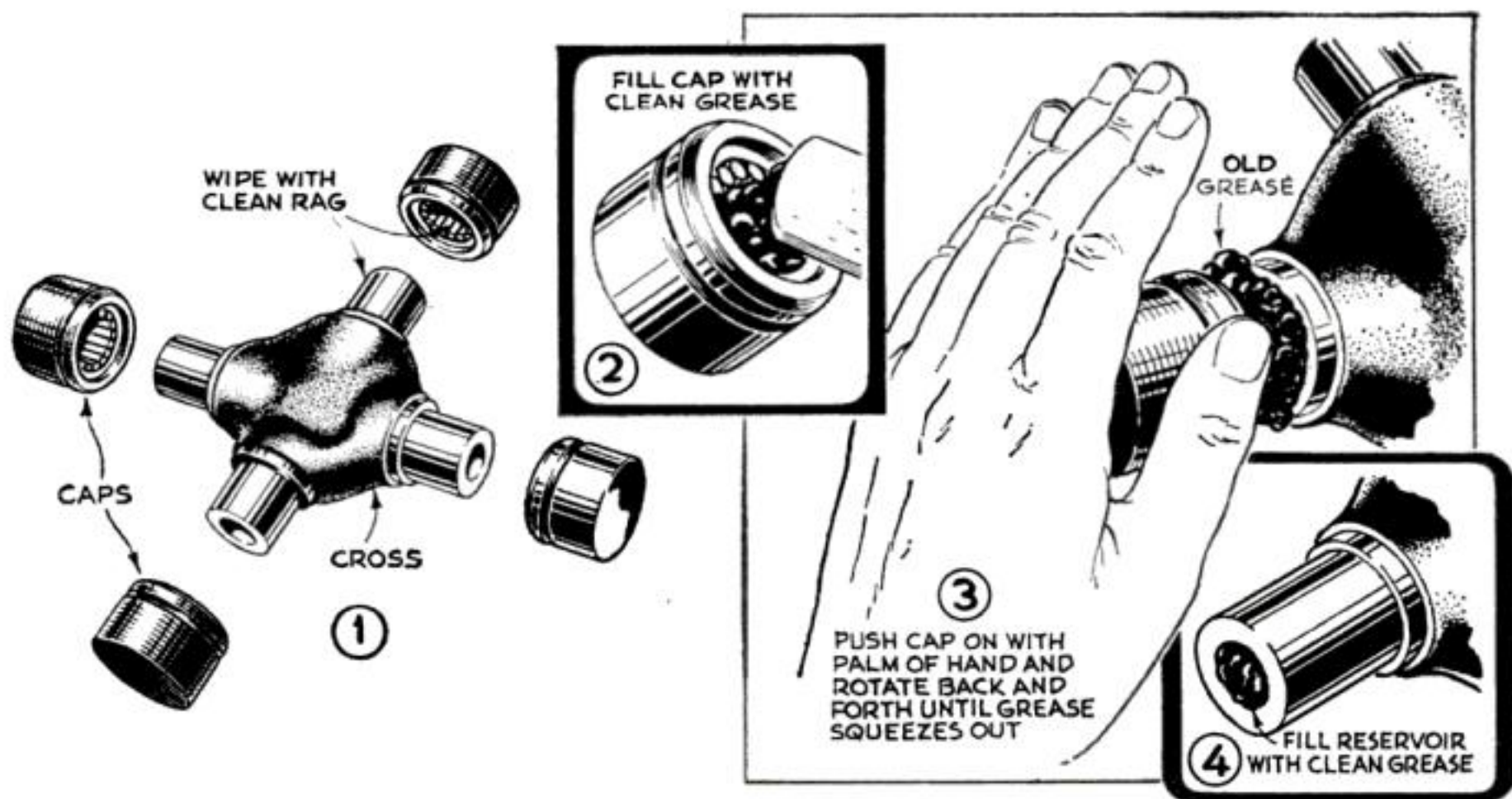


No need to bleed brakes after removing rear backing plates. Loosen the brake-line junction box (bolted to rear axle); there's enough give in the flex lines to allow removal of backing plates without disconnecting the copper tubing.



Silence loose, squeaky windshields and rear windows with a little ordinary talcum powder. Run a nail file around the rubber gasket that holds the glass in place. As you pry the rubber away, sprinkle the powder between the gasket and the glass.

.....

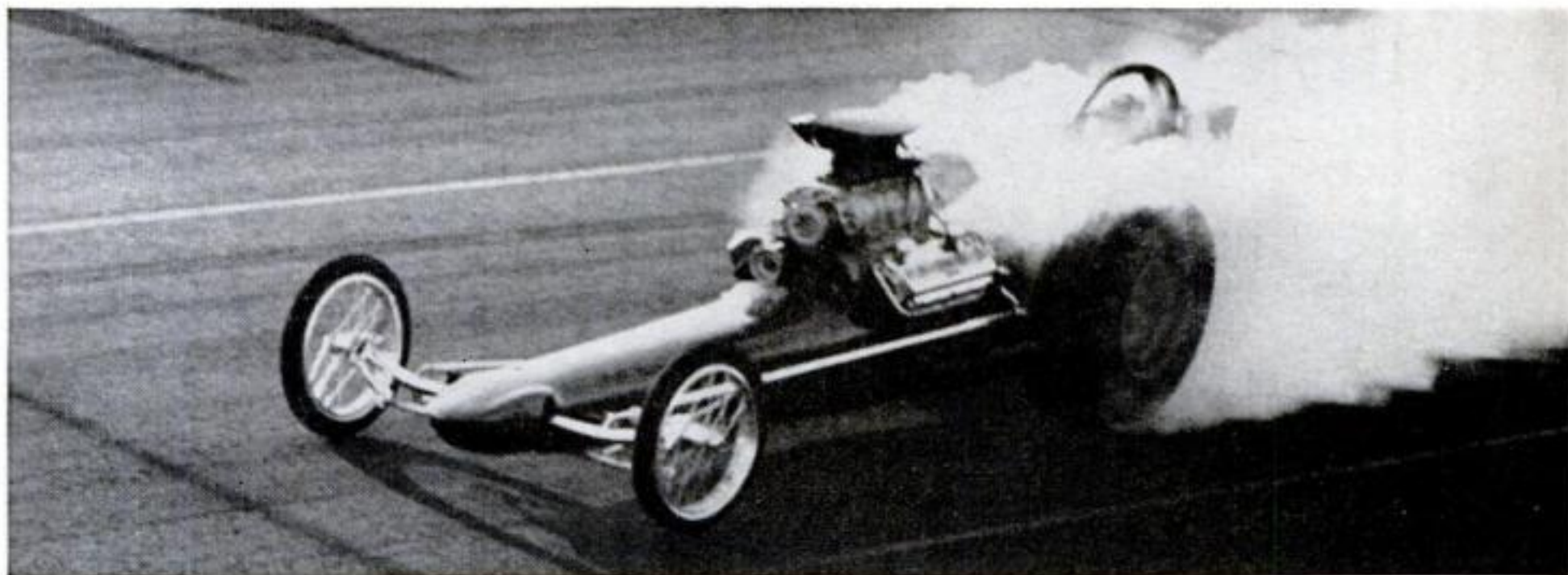


Packing a universal joint is easy if you follow this procedure: When the joint is disassembled, wipe out as much of the dirty grease in the cap and cross as you can reach with a clean rag. Then fill the cup with clean grease and force it back on

the cross shaft, twisting it back and forth with the palm of your hand. The dirty grease will be forced out and can be wiped away. Repeat until the grease comes out clean. Now you can fill the reservoir and reassemble the universal joint.

FASTEST "DRAGSTERS" OF THEM ALL!

Designed for all-out acceleration over a quarter-mile straightaway, these two "dragsters" are the kings of their kind. And both spark their amazing power with silvery-plated Champion spark plugs . . .



ON LAND: By the yardstick commonly used in automotive road tests, going from a standing start to 60 mph in 10 seconds is potent performance indeed. This "dragster" took just 7.77 seconds to cover a quarter mile from a standing start, crossing the finish line at 190.26 mph! That's the quickest quarter-mile acceleration run on record, made last January by this remarkable racer. Built by Californians Keith Black and Tom Greer (driven by Don Prudhomme), its Chrysler engine is fired by Champion spark plugs.



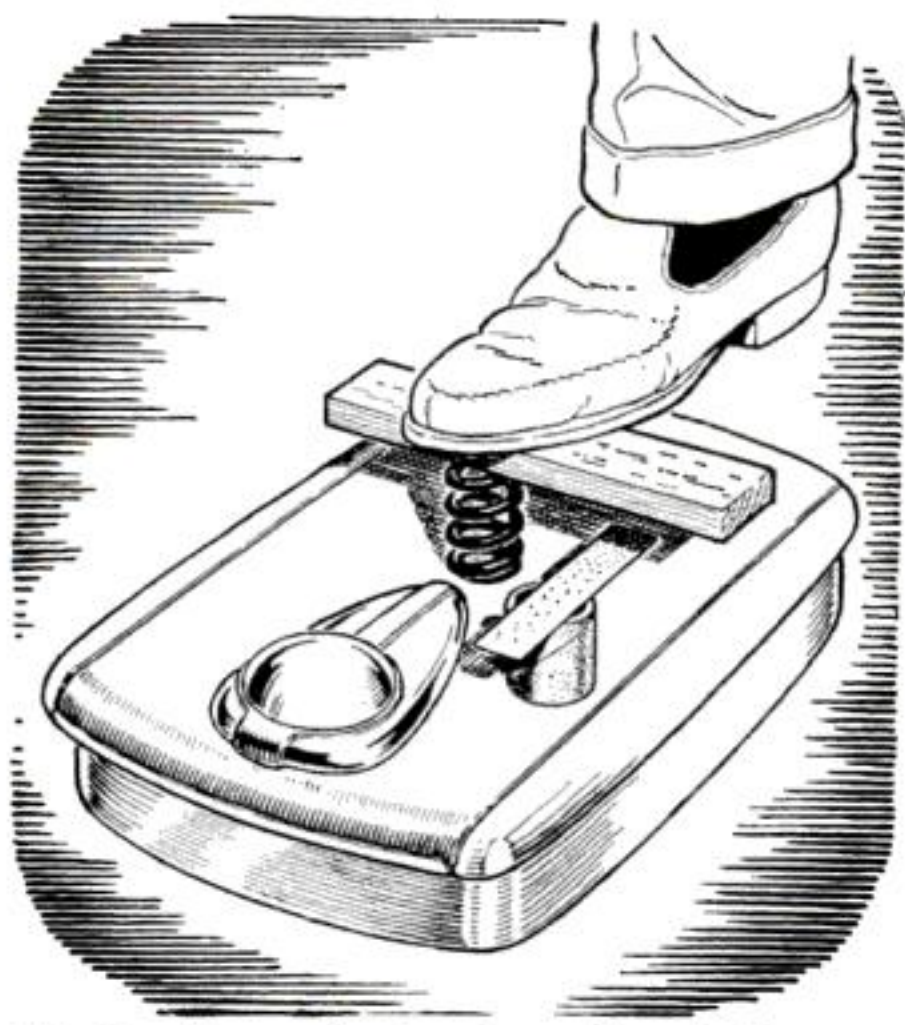
ON SEA: Floating "dragsters" are fairly new on the speed scene—and they really travel. At the end of a quarter mile this boat, the "Golden Thing," was slashing over the water at a record speed of 152.80 mph! It happened at the World Championship Boat Drags last fall, with Chuck Gireth driving. The "Golden Thing's" Champion-equipped Chrysler engine was set up by the same Keith Black who co-owns and tunes the world's quickest land dragster (see above).

Why do engine experts like Keith Black—the man who prepared these two record-holding dragsters—choose Champion spark plugs? Because engine experts everywhere know from experience they can depend on Champions to deliver absolutely all the performance that can be squeezed out of an engine! Why settle for less from your engine? Always specify Champions.

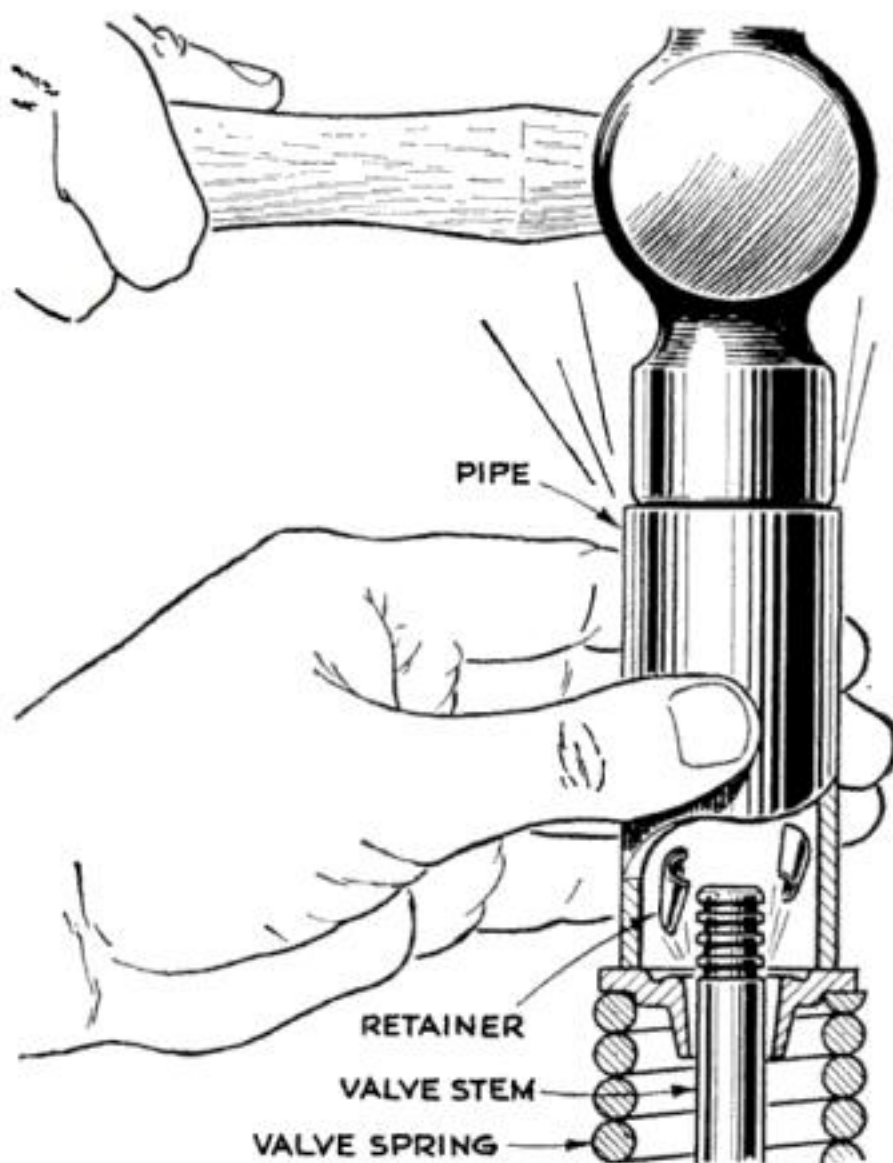


Champion Spark Plug Company
Toledo 1, Ohio

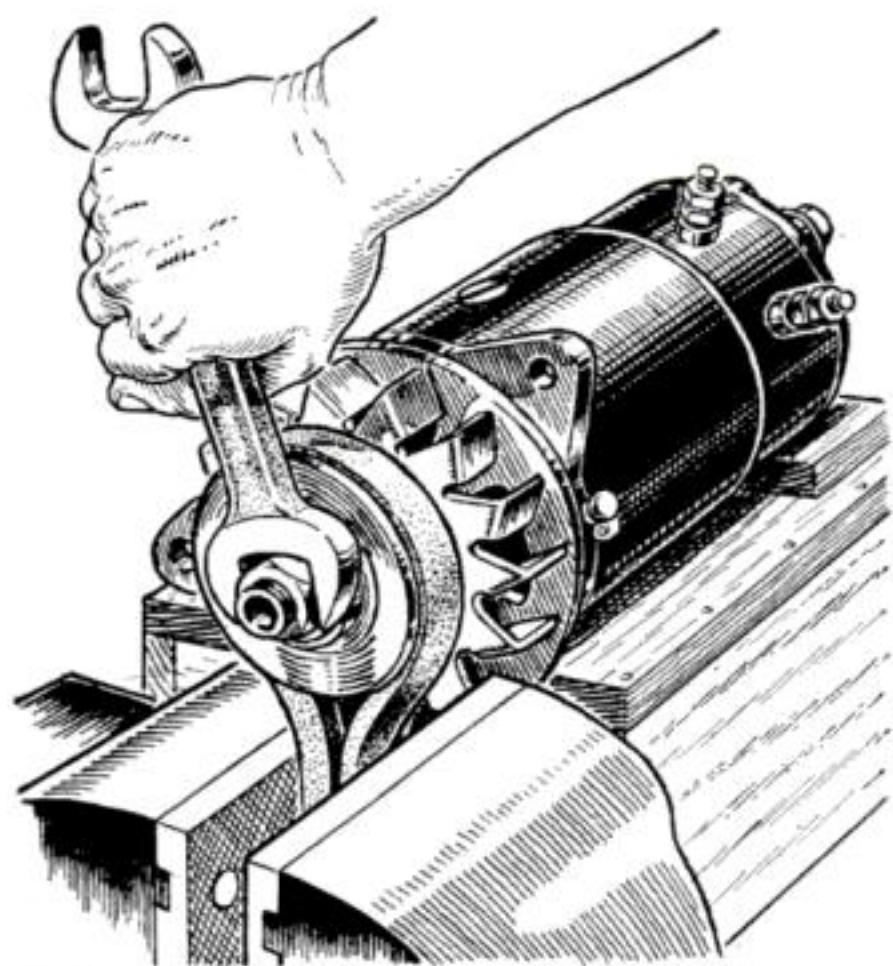
More Hints from the Model Garage



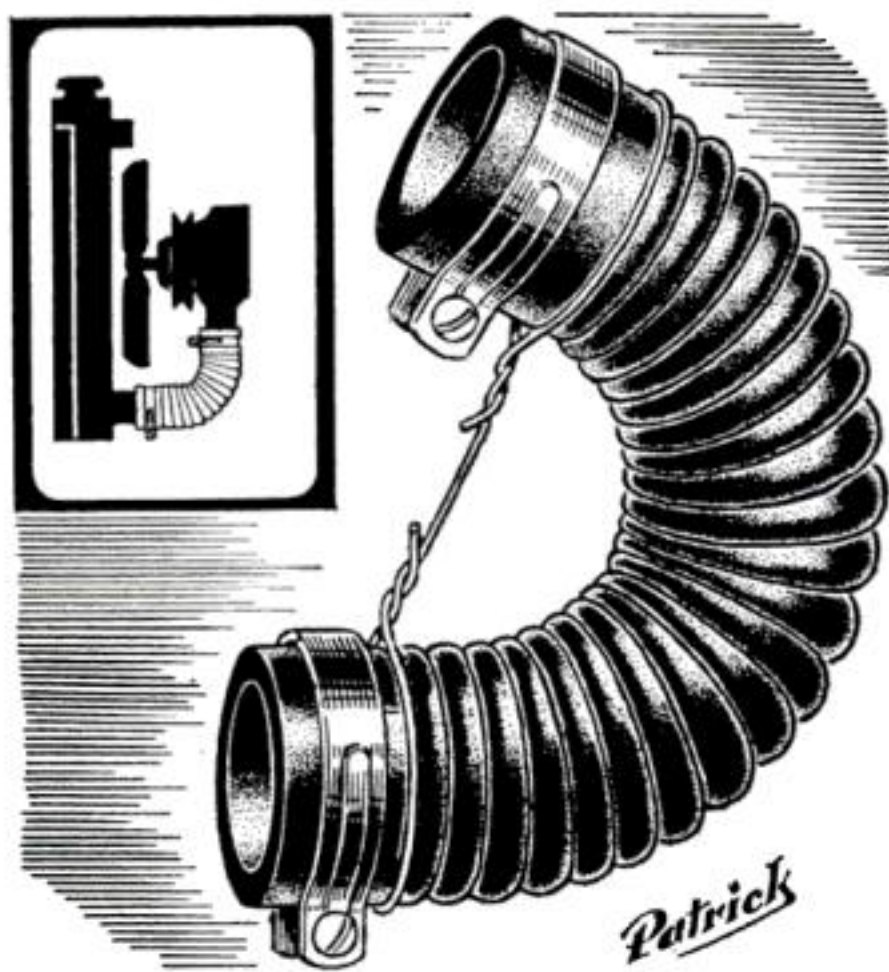
Check valve-spring tension with a bathroom scale. Cut cardboard tube to length specified for compressed spring. Lay cardboard strip over tube, and block of wood over spring. Step on wood. When the strip starts to tip, take a reading on the scale.



Overhead-valve retainers pop off with a minimum of fuss if you force them out with a piece of pipe. Slip the pipe over the valve stem onto the retainer washer. Strike the pipe a solid blow with a hammer. The retainers will jump out inside the pipe.



To loosen the nut on a generator, wrap an old fan belt around the pulley as tightly as possible. Then squeeze the belt in a vise. This will hold the generator securely and allow you to remove the nut without danger of damaging fragile parts.



Installing a flexible lower radiator hose isn't easy when working room is limited. Try preshaping the hose into a U and fastening the ends with wire. Position hose and loosen the wire. This releases the hose, which forces itself into place.

YOU BET YOUR LIFE ON YOUR SHOCK ABSORBERS



GUARD YOUR LIFE with Monroe-Matic® shock absorbers. On many occasions, law enforcement officers have reported worn shocks to be a frequent cause of accidents. Monroe-Matics prevent dangerous wheel bounce side sway, give extra stability and complete control for safer, more comfortable driving.



CHECK YOUR MILEAGE. After 25,000 miles, your shock absorbers are certainly due for replacement. Shocks wear so gradually that you're not aware of an increasingly rougher ride and loss of control. Don't take chances. Replace shocks all worn with new Monroe-Matics.



TAKE A TIP from the champions. Racing drivers choose Monroe-Matics almost exclusively for the ultimate in car control under the toughest conditions. Every Indianapolis winner in the past 11 years has ridden on Monroe-Matics. Safe highway driving also calls for Monroe-Matic control.

LOOK FOR THE YELLOW AND BLUE

Ask about the

MONROE DEMONSTRATOR BARREL

60-day free ride



MONROE AUTO EQUIPMENT COMPANY Monroe, Michigan
In Canada, **MONROE-ACME, LTD.**, Toronto, Ontario
In Mexico, **MEX-PAR**, Box 28154, Mexico City



World's largest maker of ride control products including both front and rear **LOAD-LEVELER®** stabilizing units



The girl turned to Gus. "Do you have any idea what he's talking about?"

Gus and the Case of

By Martin Bunn

IT WAS Saturday, and business was slow at the Model Garage. Stan Hicks had finished a job due at noon and was on his way to wash up for lunch when a car drove in.

"I'll take care of that," said Gus, coming from the office. "You go along to the diner."

"Thanks, Gus. I . . ." Stan swallowed his words as the driver got out—a petite brunette, no more than 19, and pretty enough to have stepped off a magazine cover. She wore a white satin blouse and a brightly colored skirt and cape.

"I've got time," Stan hastily assured Gus. "I'll see what I can do."

Gus looked toward the girl, grinned, and went back to the office.

The little brunette was scowling as Stan came up, her jaw set angrily, her eyes giving off sparks.

"Well, don't just stand there; go ahead and start," she demanded.

"Start? Start what, Miss?" asked Stan.

She banged a small fist against the side of the car, a popular six-cylinder model about seven years old. "Just listen to it!"

Stan tore his attention from the pretty face. The car engine was idling irregularly, sometimes almost stalling.

"It sounded like Jack Benny's old Maxwell all the way from home," the girl cried. "Hurry up! I don't want to miss the *whole* meet!"

Stan opened the hood. "Has it been running like this for long?"



the Mysterious Miss

"Days and days. I've already had brand-new plugs put in the thing, so don't tell me it needs *them*."

The wiring was old but not visibly cracked. All six plugs evidently were new, although their porcelain was almost hidden by long, hardened rain caps. Stan gunned the engine briefly. It responded raggedly but there was none of the sputtering typical of fuel failure.

Letting it idle again, he wrapped a rag around his fingers and gently tugged on the cable to the number-six plug. It was tight on the plug terminal. So were the cables to plugs five and four. But the engine's off-beat rhythm changed as he pulled on the cable of number three. He yanked it off, and the engine stalled. Squeezing the cable socket a trifle, he pushed it back

on and restarted the engine. The miss was still there. The other two cables seemed tight.

"Look here, Miss—" began Stan.

"Ann Bliss. You look. Can't you fix it while I go to the track meet? I've come all the way from Stanville, and it's already half over. I tried three gas stations—and they couldn't fix it. One suggested I come here."

A horn blared outside.

"That's Betty!" shrieked the girl. "She's come to take me back; I've got to rush. *Please* see what you can do."

She was gone in a swirl of skirt.

"In a hurry, wasn't she?" commented Gus.

"Going to that junior-college track meet at the stadium," answered Stan, dreamily. "Cute name she's got—Bliss."

"Uh-huh. And you have about one hour to find that miss for Miss Bliss."

Methodically, Stan removed the plugs, reset the gaps on two, wiped the porcelains, and replaced all six plugs. He checked the point setting, made sure the high-tension cables were well spaced—neither cross-firing nor shorting to engine parts—and the low-tension wiring tight.

The engine still ran raggedly.

Nursing his hunch that ignition rather than the fuel system was at fault, Stan opened the distributor again. He pulled the center cable from the cap, held it near the engine, and, with the ignition on, flicked the points open by hand.

A juicy spark gave coil and condenser a clean bill of health.

Making sure that the cable end and its socket were clean, Stan examined the cap for corrosion, cracks, or spark tracks. He found none. The rotor seemed all right, but he put in a new one before trying the engine again.

It sounded just the same. Stan, head cocked, was puzzling out his next step when Gus came out.

"Just had a phone call from Mrs. Brownell. She's at the stadium and she says one power window is jammed and she can't move her car."

"Can't drive because a window's jammed? Sounds goofy."

"I know, but she's a sensible woman, and a good customer. I have to wait for Judge Toler to come for his car. You go—she's in parking lot B—and I'll take a look at this job."

Stan nodded, hastily explained what he'd done so far, and drove out.

Traffic was heavy as homeward-bound cars spread out from the stadium. But section B wasn't empty when Stan arrived. It held a milling, cheerfully noisy group of students—and Mrs. Brownell's big two-door sedan.

A serpentine line of students was rhumba-

stepping around it. They cheered as Stan, toolbox in hand, broke through to the car.

From an almost-closed rear window hung a girl's arm.

Mrs. Brownell was standing beside the car. "Please do something, Stan," she said breathlessly. "You can see why I didn't dare drive—with her arm hanging out the window."

"I'll sure try," promised Stan.

"Some boys were teasing her," the woman explained. "So I thought I'd close the window with the button up front, not knowing they'd grabbed her hand and were holding it."

Stan opened the driver's door—and stared.

The trapped girl was Miss Bliss.

"Hey—never expected to see you here. But don't worry; the boss is fixing your car."

"Stop talking nonsense and get me out of this," the young woman retorted.

Turning the key to "radio," Stan tried the control button at the front window. It slid down obediently. Pressing the remote button for the rear window had no effect. The one at the window itself produced only a ratcheting

sound much like sprocket teeth jumping out of mesh.

Stan disconnected the battery. Getting into the rear of the car, he took the screws out of the window frame.

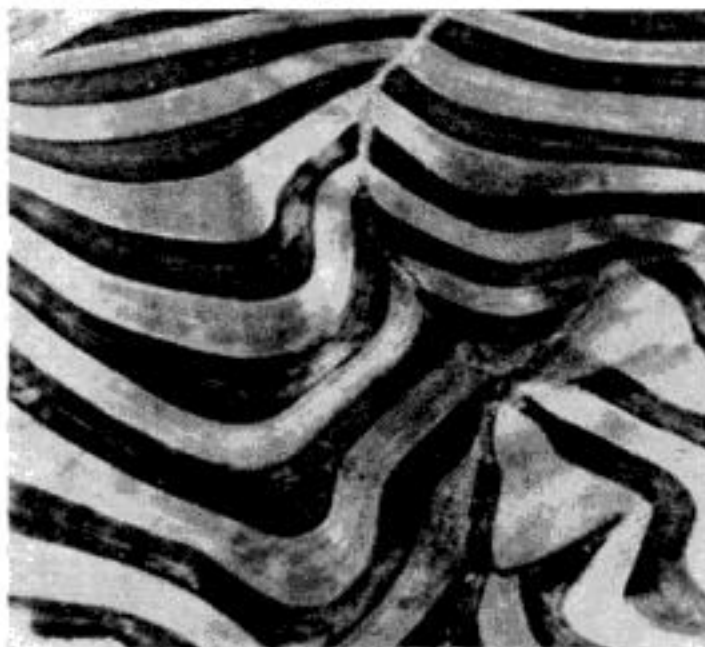
The girl shifted lithely out of the way as far as possible, while outside the crowd yelled encouragement, much of it suggesting a more personal approach.

Perspiring, Stan got the frame free of the window and hung it on the girl's shoulder.

To detach the armrest he had to put one arm around the girl. Then, with the lining panel off, he loosened the screws holding the inspection plate.

Now he could see that the driven sprocket, overloaded when the girl's arm blocked the rising window, had sprung out of mesh. On-the-spot repairs were im-

.....
What's this a photo of?
.....



ANSWER: Not a shimmying zebra, but strip farming out west, following contours on each side of a draw.
.....




AC SPARK PLUG  THE ELECTRONICS DIVISION OF GENERAL MOTORS

AC sparks five out of six

One of the real tests of any spark plug is acceleration—response when you want it most! In the 1963 Pure Oil Performance Trials at Daytona, stock cars equipped with standard AC Fire-Ring Spark Plugs captured first place in five out of six acceleration tests. One reason was AC's Self-Cleaning Hot Tip. It heats faster to burn away harmful carbon deposits. The result: sustained peak power mile after mile.

Get the same winning power response from your car. Be sure your tune-ups include performance-proved AC Fire-Ring Spark Plugs with the Self-Cleaning Hot Tip.

 Acceleration competition was in the important driving range starting at 25 miles per hour. All entries were finely tuned, used premium gasoline, and were driven by professional drivers. These tests are not a measure of vehicle top speeds.



**FIRE-RING
SPARK PLUGS**

possible. The only course was to remove a bolt that served as the pivot of the lifting arm.

Stan considered, with some agitation, the task before him. The nut was hard to reach; to hold the bolt, too, he'd have to use two wrenches, working close to the window. He began to wish the crowd outside would all go home.

He explained to the girl. She gave him a blistering glance and shrank back, arching her body to let him reach past. Stan became acutely aware of her perfume, while quips from the crowd grew louder. The wrenches felt grease covered. Once Stan almost dropped one inside the window space. The nut could be turned only a little at a time.

Finally it came off, to his relief. He tapped out the bolt and caught the window-pane just as it dropped.

A cheer rang out as the girl drew in her arm and squirmed away, across the wide seat. Mrs. Brownell was by her side at once with a first-aid kit. Stan scrambled out of the sedan.

"Drive to the garage and we'll fix the window, ma'am," he said, turning toward the pickup.

Suddenly the ground fell away under him as hands clutched and raised him. To a chorus of "He's a Jolly Good Fellow" he was carried to the truck.

Gus was writing out a bill for Judge Toler when Stan drove in and made for Gus. "How'd you make out?" he asked.

"Didn't get far with your job," confessed Gus. "The judge had a million questions, as usual."

"Got an idea," said Stan. He started the engine, then switched off the droplight he had been using.

For a moment they could see little. Then Stan spotted a faint bluish thread snapping along number-one plug.

"You got it, Stan," agreed Gus. "Intermittent shorting—there it is at numbers two and three, too."

Sparks were jumping between the rain caps and the screw shells of the plugs. Stan tugged at number-three cable. The sparking ceased, and the engine seemed to steady slightly. He pushed the cable on hard, and immediately the sparks appeared again.

"Haven't you finished yet?" The last word was a squeak of dismay.

Both men turned to confront the owner of the car—and the white satin blouse.

"Been kind of busy with a few other things," returned Stan. "Like getting you loose at the stadium."

The girl turned to Gus. "Do you have any idea what he's talking about?"

"No, but let me ask one," said Gus. "Has this car had a radiator leak?"

"Uh-huh. Water sprayed all over before it was fixed. Why?"

Gus had pulled off a plug cable. He folded back the edge of its rain cap.

"Look at this, Miss," he said. "Here's why—and Stan found it. These old hoods are loose on the plugs, so some spray bounced off the engine and got into them. Old radiator water's rusty. It dried inside these caps, but the rust stayed. That made a dandy path for short-circuiting ignition juice."

"How long will I be held up here?" asked the girl, sounding worried.

"I'll put on all new caps," said Stan. "Quickest way to finish this job."

The girl watched coolly as he set to work. Just as he finished, the Brownell car drove in.

"I didn't come about the window," the driver called. "Just to bring Katy. She's so grateful to Stan. So am I."

Stan swiveled his head in bewilderment from the girl beside him to the one getting out of the car. Their dress was identical—swirly skirts and white satin blouses.

"Hey! There are two!"

"There always are—of twins," said Mrs. Brownell. "I'll be back with the car on Monday."

She drove out. Stan started the engine. It idled perfectly.

"That does it, gals. No more missing, now."

Stan closed the hood and turned to find himself facing Ann Bliss. He grinned tentatively.

"Guess I acted like a creep," she said, smiling. "I'm sure grateful to you for fixing the car, and I get the idea that you did something nice for my sister, too. So thanks awfully."

Stan's grin widened.

"Did you know," asked Ann Bliss, "that three other mechanics flunked out on this job? It took *you* to solve the case of the mystery miss."

"Two misses," returned Stan. "The car part was only half of it." ■ ■

Here's what we mean when we say the **Continental mark II** really is a new...and different muffler!

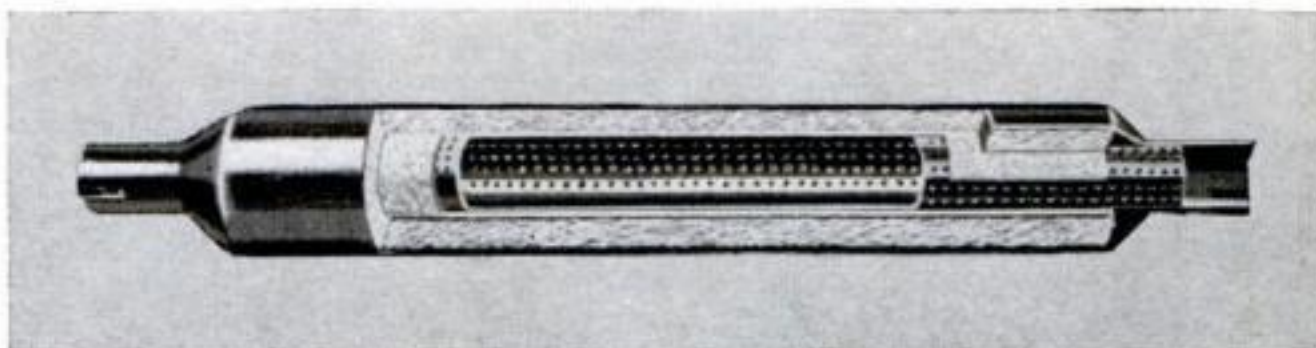
NEW OUTSIDE

Smooth, streamlined one-piece European-type muffler... with no seams to open up... no joints to blow... no connections to crack or break loose. Heavy-gauge steel, coated for extra durability and rust resistance.



NEW INSIDE

Straight-through design eliminates restrictions to free flow of exhaust gases. New sound-absorbing glass fibre insulation cuts engine noise to an authoritative purr of power!



NEW ECONOMY PRICE! You won't believe so much performance can be yours for such a modest cost! Continental Mark IIs are made for any car or small truck—late models, old family cars, sports cars, hot rods.

NEWLY ENGINEERED for top engine performance and gas economy. The Continental Mark II is made by Walker, one of the largest makers of mufflers for new cars. Walker engineers incorporated design features that prevent build-up of back pressure, and thus help engines deliver full smooth-flowing power for quick acceleration, hill climbing, real traffic flash, and maximum gas economy. You can buy a Walker Continental Mark II from your regular service station or garage.

Do you know that some mufflers waste One out of every 10 gallons of gas? Cut pick-up by as much as 47%? Account for accidents frequently listed as "cause unknown"? You'll find out why, when you read "YOUR MUFFLER, YOUR CAR, AND YOU." This new, authoritatively written booklet will be sent you without charge. Fill out and mail this coupon today. Do it now!

FREE!
*Mail coupon
Today!*

WALKER

Dept. X.
Walker Marketing Corporation
Racine 6, Wisconsin
Gentlemen:
Please rush me a copy of "YOUR MUFFLER, YOUR CAR, AND YOU."

Name _____

Address _____

City _____

Zone _____

State _____

SHOP TALK

By Sheldon M. Gallager



Hate to clean paintbrushes? Try this tip from the experts



Soak the brush well—in *two* separate solvents.



Next, rinse it in mild detergent and warm water.



Finally, spin it dry, wrap in paper, and store.

I figure the Du Pont people make a lot of paint and ought to know how to get it out of a brush, so I asked them. The secret, on oil-base paints, is a double soak. Fill two containers with solvent or whatever brush bath you usually use. Work the paint out of the brush in one container, then repeat the process in the other container. This gets rid of paint that would normally be deposited back on the brush from dirty cleaner in the first container.

Follow this with a bath in mild detergent, a warm-water rinse, and a final spin dry. On water-base paints, skip the solvent steps, but follow the same procedure with detergent and warm water. You'll be surprised, says Du Pont, at how you can keep a fine brush in good condition for years this way. Incidentally, here's an interesting fact: According to Du Pont, a nylon-bristle brush is a far better bet on water-base paints than natural bristles. The reason: Natural bristles soak up the water, swell out of shape, and quickly become difficult to use. Nylon bristles do not absorb water.

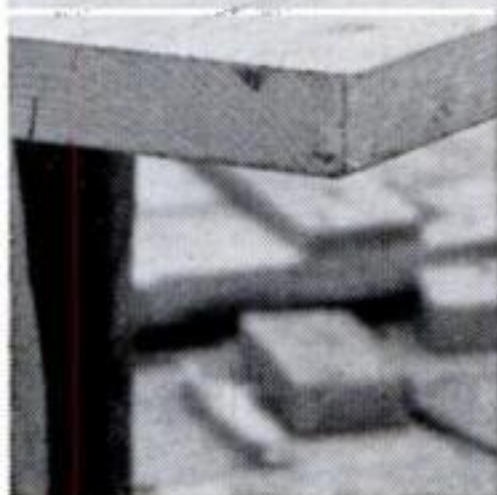
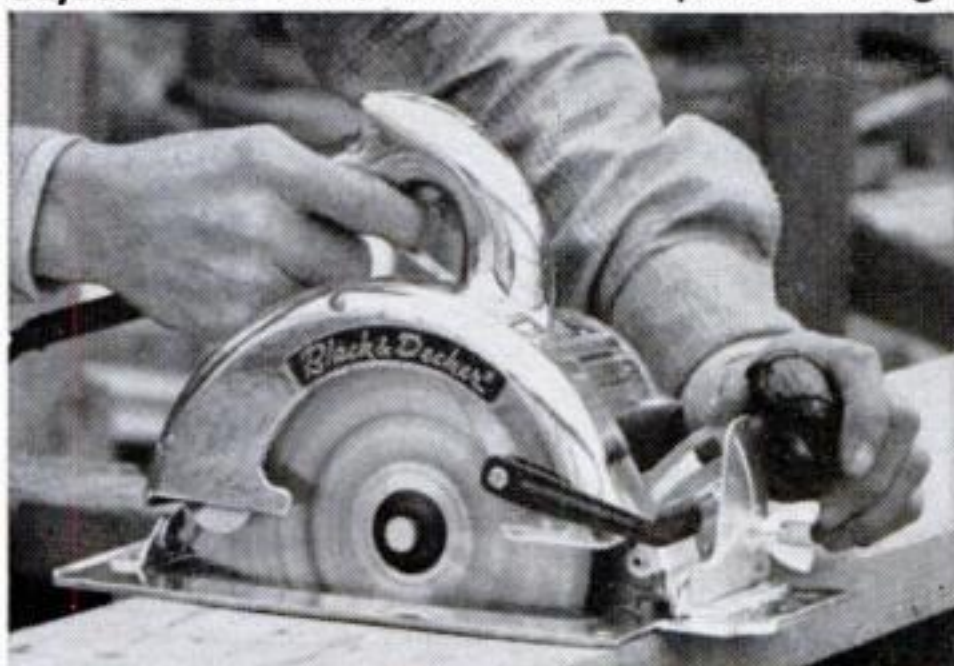
Now: Do-it-yourself lab equipment

If you enjoy doing science experiments with a youngster, I think you'll go for a fine new book that I've had as much fun with as my own son, Scott. Entitled *Build-It-Yourself Science Laboratory*, it's packed with 200 pieces of equipment you can make inexpensively for experiments in physics, chemistry, biology, geology, astronomy, navigation, meteorology, and other subjects. Published by Doubleday, NYC, it will sell for \$4.50. The author is Raymond E. Barrett.

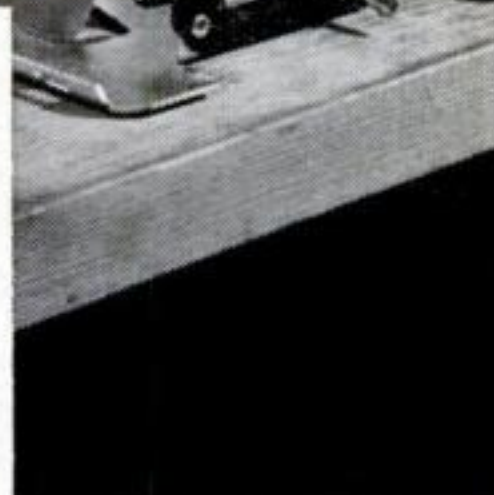
New use for a fishing sinker: It'll make a drill bit stick

Ever have trouble chucking a tiny drill bit when the jaws won't close down far enough to grip it? Here's a tip from R. H. Hunger of Washington, Ill.: Press the bit into a split-type fishing sinker, then chuck the sinker. Adjust it on scrap first for minimum runout.

PROFESSIONAL'S PRIDE. Black & Decker's U-337 7¼" Professional Heavy-Duty Saw has superior M-L wire for increased overload burnout protection. All ball bearings. Accurate depth and bevel adjustments. Built for continuous power sawing.



ALL MUSCLE, ALL "GO." Black & Decker's U-136 6½" Utility Saw (like other B&D saws) has triple-dipped armatures for greater dependability, durability. Sawdust ejector. Your best saw buy for quality, power, accuracy. Saws from under \$50.



Pick the saws that are powered for top performance by the world's leading maker of power tool motors.



Black & Decker®

MAKER OF THE WORLD'S FIRST CORDLESS POWER TOOLS

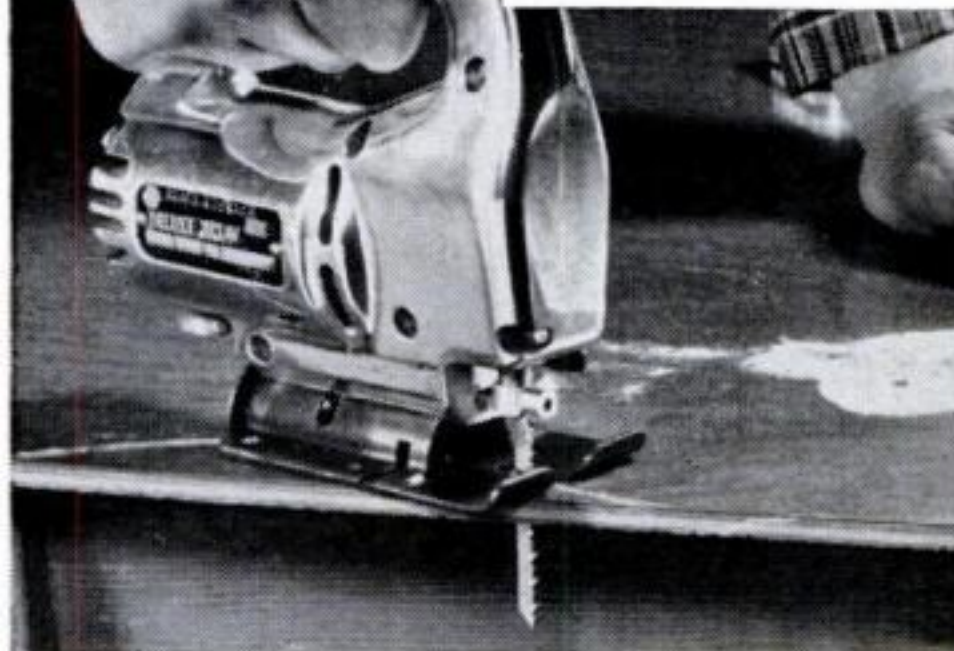
Master Power

AIR TOOLS

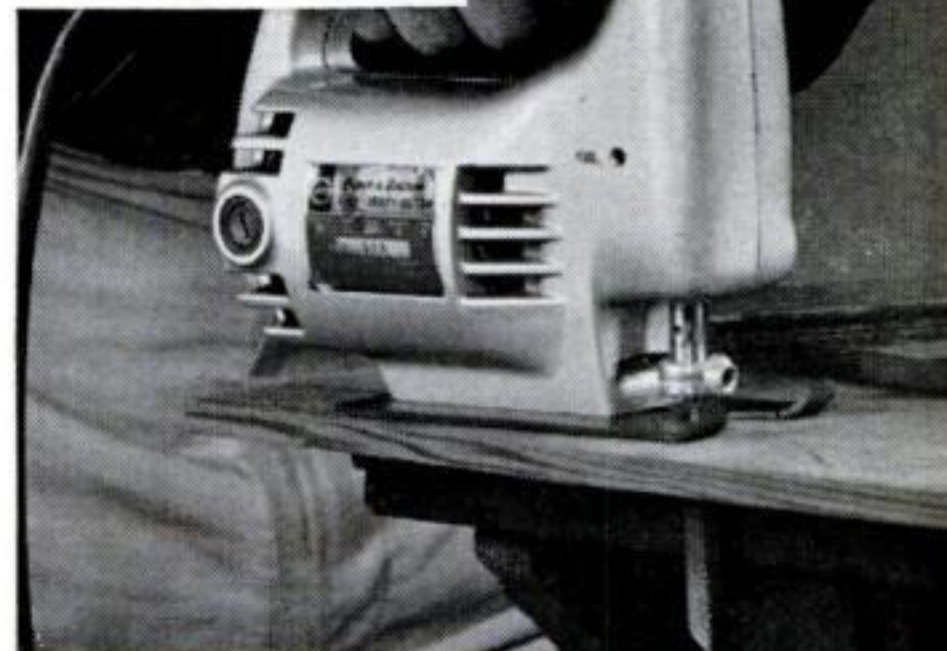
DeWALT

POWER TOOLS

CHECK YELLOW PAGES "Tools-Electric" for the nearest B&D dealer. Send 25c for 180-page book, "How to Choose and Use Power Tools" to: The Black & Decker Mfg. Co., Dept. P053, Towson 4, Md.



CYCLOID ACTION. Black & Decker's U-351 Professional Jig Saw has fast, extra-smooth cutting power. Blade teeth cleared on each stroke. Nylon shoe insert. Tilting shoe for bevels up to 45°. Four blades, rip fence, circle-cutting guide included.



HIGH ON PERFORMANCE—LOW ON PRICE. Black & Decker's U-151 Utility Jig Saw handles like a sports car—makes straight, curved or irregular cuts effortlessly in wood, metal, plastic. Perfect balance and control. Jig saws from under \$24.

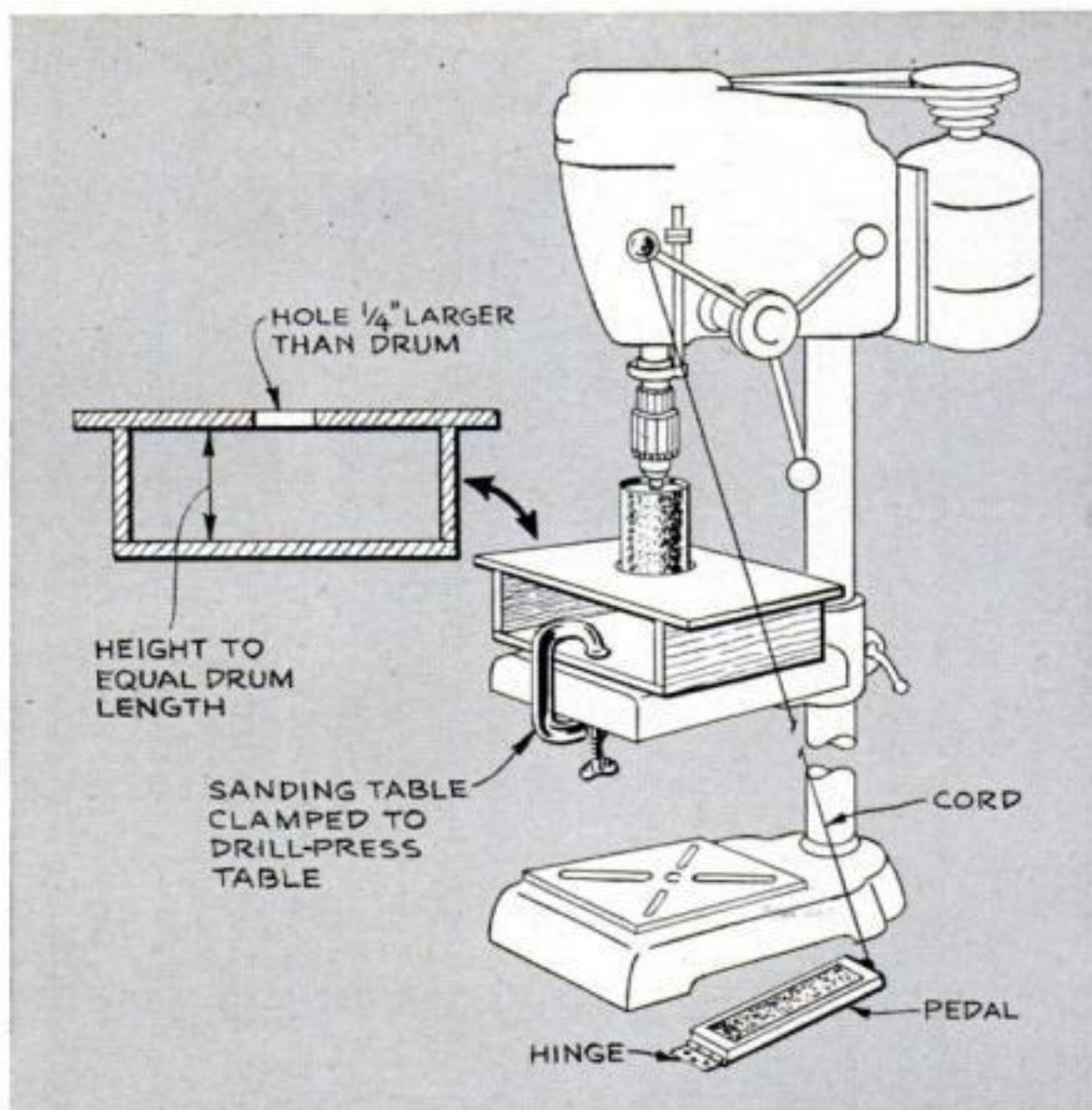
Short Cuts and Tips

FROM
PS
READERS

Pedal oscillates sanding drum on drill press

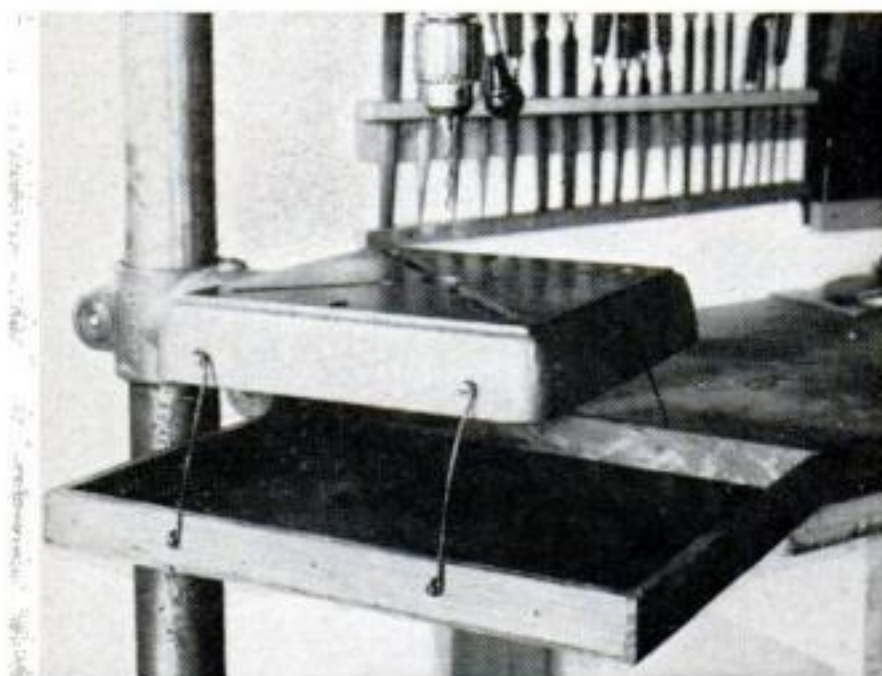
Sandpaper on a sanding drum used in a drill press will last much longer if you make the drum oscillate the way commercial spindles do.

You'll need a wooden table to mount on top of the regular one—with a hole in the top $\frac{1}{4}$ " larger than the sanding drum. Hinge a pedal to the floor and run a cord from the free end up to the feed handle, to free your hands for the work.—*King Basham Jr., Linden, Tex.*



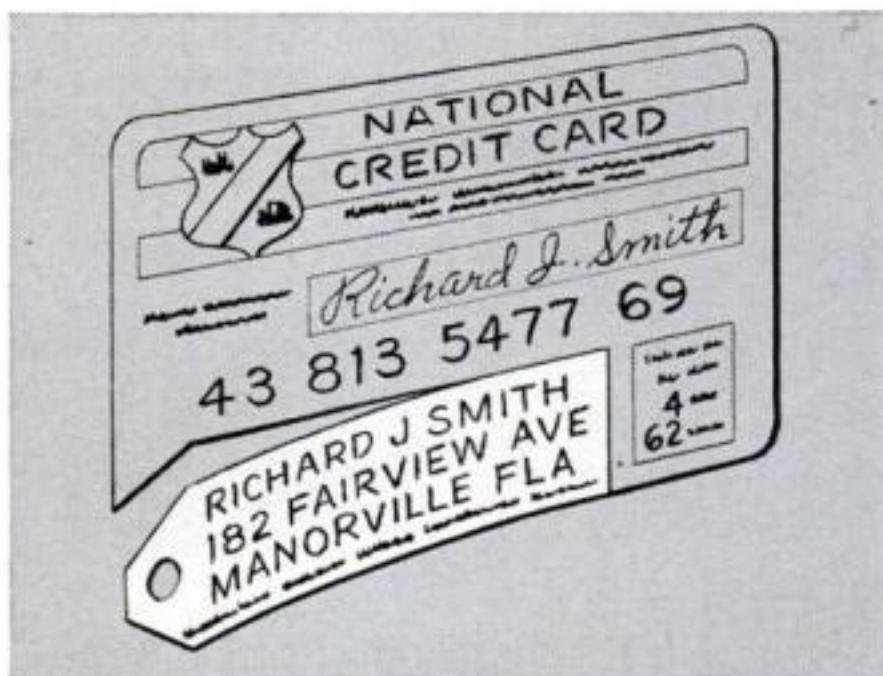
►►►The cab of a truck is always short on storage space. I solved the problem by attaching a motorcycle saddle bag to the inside of each door with sheet-metal screws. By carrying my tools, rags, and extra parts in these bags, I keep such items clean, off the floor, out of sight—yet within easy reach.—*Dean I. Sille, Newton, Iowa.*

►►►One workshop accessory gets my wife's endorsement: a door mat at the exit. I wipe my shoes when I leave, so I won't track sawdust, shavings, metal filings, or paint and oil drippings into the rest of the house. It saves me work, too—I don't have to refinish scratched and stained floors.—*A. R. Tanner, Poughkeepsie, N. Y.*



Chip catcher for a drill press

A tray slung 6" below the table of my drill press saves cleanup time. It is 4" wider than the drill-press table, and extends about 2" at the front. The bottom is $\frac{3}{8}$ " hardboard, and the sides are $\frac{3}{8}$ " by $1\frac{1}{4}$ " deep. For cleaning, it unhooks from the four 8-32 machine screws in the table edge.—*Dana S. Greenlaw, St. Petersburg, Fla.*



Name tags from credit cards

Don't discard old identification or credit cards. If you snip out the section with your name and address, and punch a hole in one end, you've got a readymade tag for luggage, camera cases, key chains, and other valuable articles. Cards that are printed on plastic make the most durable tags.—*Harold L. Gray, Crawfordsville, Ind.*



Saber Saw



Radial Power Saw



Jointer



Drum Sander



Shaper



Surfacer



Tilt Arbor Saw



Buffer-Polisher



Metal Cutter



Grinder



Dado Saw



12" Lathe



Horizontal Drill



Router



Disc Sander



NEW DEWALT POWER SHOP* SAVES YOU HUNDREDS OF DOLLARS IN POWER TOOLS

With Minute-Magic Changeovers, this handsome DeWalt Power Shop becomes 15 power tools in one—gives you professional results *faster* and *easier*. DeWalt's power, capacity and flexibility make it a never-ending pleasure for you to build things for the family from a hutch cabinet to a complete house. Compact, it fits into a workbench. Your dealer has the free plans. Ask him for a demonstration and find out why experts and beginners have been saying "There's nothing like DeWalt!" since 1922. And don't forget to ask for low budget terms.

*T.M. DeWalt



DEWALT, INC.

POWER TOOLS

A **Black & Decker** Subsidiary

34005 Fountain Ave.
Lancaster, Pa.

☐ Send free 16 page catalog

☐ I enclose \$3.95 for illustrated book "Newest Ways to Expert Woodworking." (Check or M.O.)

Name.....

Address.....

City..... Zone..... State.....



what's new

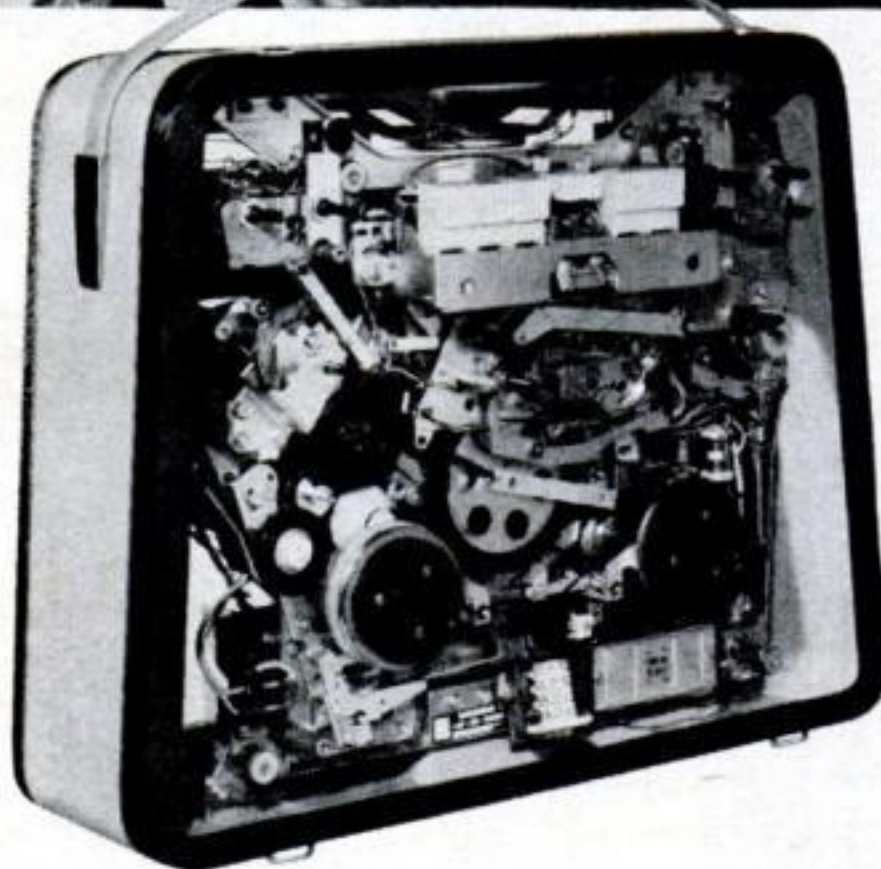
ELECTRONICS



Stereo Recorder Is Transistorized

THIS full-size, four-track stereo tape recorder has transistor amplifiers and a fourth speed ($\frac{1}{16}$ " per second) giving up to 32 hours of recording on a 7" reel.

I used one for several weeks and was particularly impressed by the sound at its slowest speed. At $\frac{1}{16}$ i.p.s., voices were natural and even music reproduction was creditable—better than on most AM radios. At the other end of the speed range, $7\frac{1}{2}$ i.p.s., you can make professional-sounding live recordings in stereo with the stereo mike supplied. Prerecorded tapes played through your hi-fi stereo system compare favorably with the very best program sources. My only complaint: a rude me-

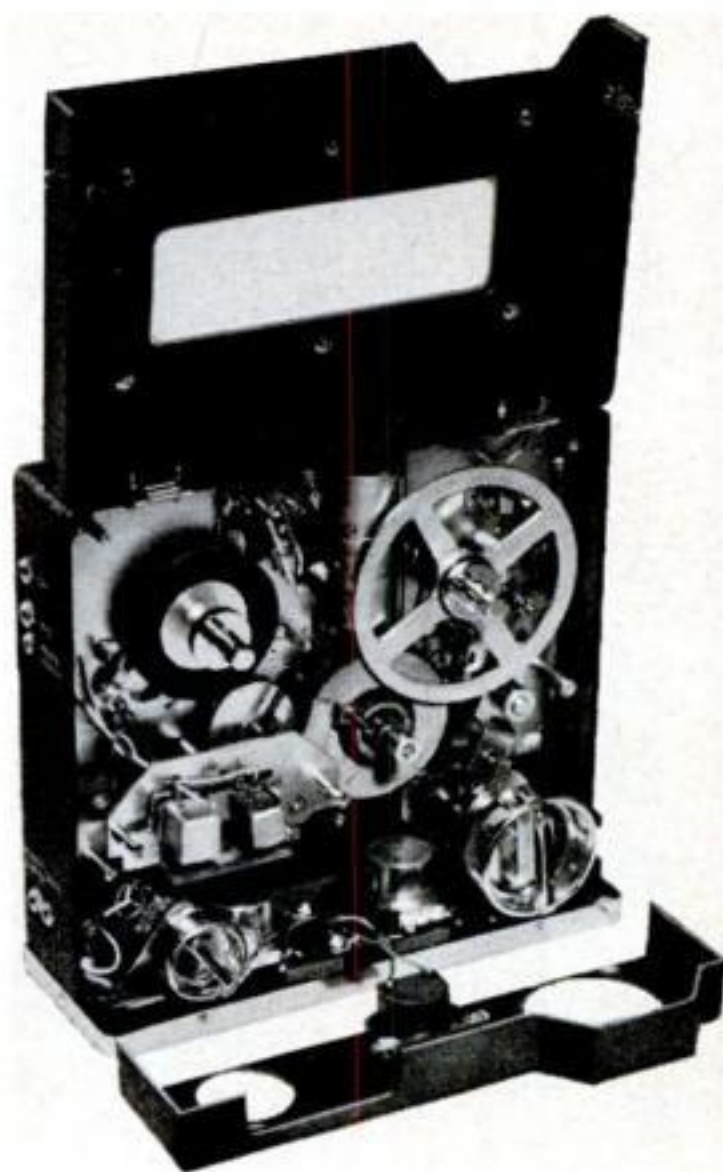


chanical noise when control is first engaged for higher speeds. But once started, there was no problem. The Norelco Continental 401 lists at \$399.50—*Hubert Luckett*.



Transistor portable gets FM, AM, and SW

You can listen to your favorite FM stations as well as short wave and standard AM stations on this 10-transistor portable. At home, you can plug it into your hi-fi system and use it as an FM tuner. It has automatic frequency control (AFC) to prevent drift on FM. Four standard C-size flashlight batteries supply power. Called the "Standard," model SR-J800F sells for \$89.95.



Portable recorder goes hi-fi

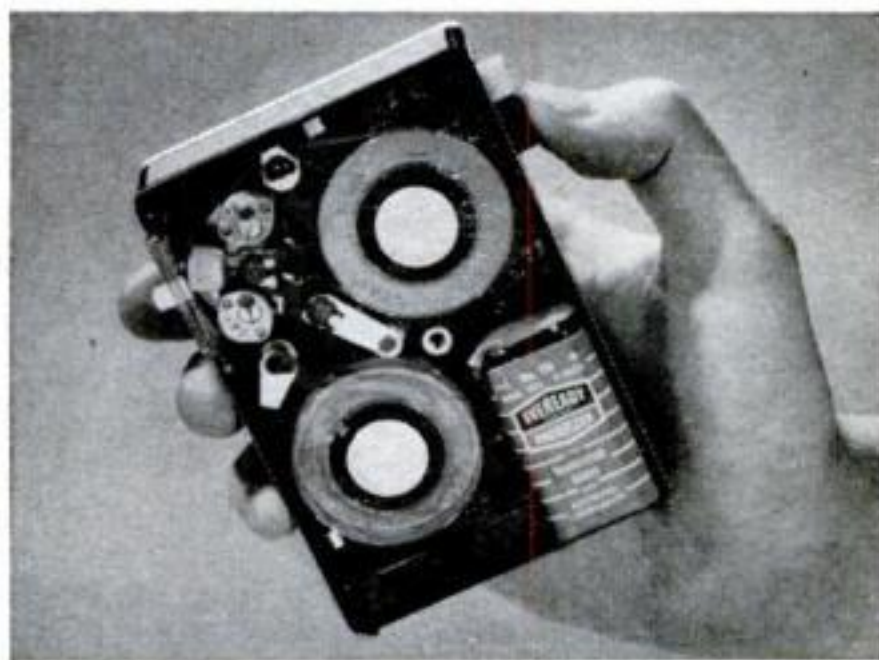
Here is a battery-powered tape recorder that offers the tape speeds and most of the features of a home tape recorder. It operates at either $3\frac{3}{4}$ or $7\frac{1}{2}$ i.p.s. with wow and flutter below .18 percent, says the manufacturer. It has AC bias and erase,

a precision capstan drive, recording-level meter, and provision for remote control. Six penlight cells provide power. A telephone recording pickup and earphone come with it. Size: 7" by $7\frac{1}{2}$ " by $2\frac{1}{2}$ ". Weight: 6 pounds. Price of Citroen 660: \$159.50.



Light up and listen

This miniature radio-lighter combination, scarcely larger than an ordinary lighter, contains a two-transistor radio with built-in antenna and battery. The radio comes on when you plug in the earphone. Standard 40-cent mercury cell lasts about 200 hours. \$9.95 by mail order from L. Bravold, 5718 Troost Ave., North Hollywood, Calif.



A talking notebook

A tiny tape recorder, little bigger than a pack of cigarettes, records up to an hour on one re-usable, indexed, reel of tape. A built-in microphone in the Memocord lets you record interviews or notes without external wires. It uses one 9-volt battery and one $1\frac{1}{2}$ -volt penlight cell. Memocord, P.O. Box 234, Troy, N. Y. Price: \$99.95.

CONTINUED

161



Tone arm (arrow), held in position by spring, plays record from underneath.



Twelve disks can be carried along in storage well at the back of the unit.

Rock and Roll While You Stroll

THIS new battery-powered radio-phonograph will play 45-r.p.m. records while being carried. It will even play when turned upside down. Both radio and record player operate on a single battery of four D-size flashlight cells.

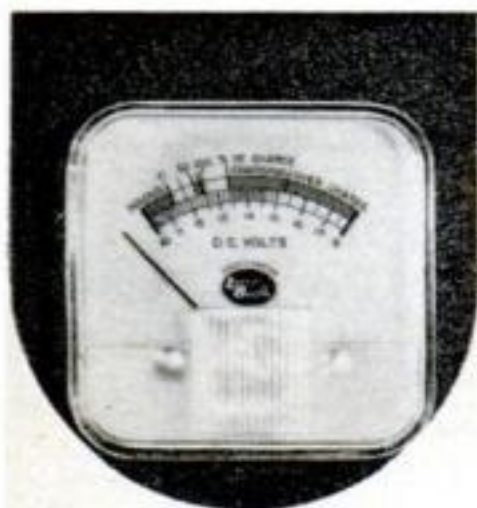
Records are held on a freely turning spindle with spring clips. A rubber wheel in contact with the record rim turns the disk. The motor is transistor-regulated to save battery energy. A plastic lid snaps in place in front to enclose and protect the machinery while it is operating.

Play is semi-automatic—you put the rec-



Radio dial, pushbutton controls, and speaker face up when unit is carried.

ord on the spindle and push a button. The tone arm comes down automatically and also returns to the starting position when the record is finished. The "Swing-Along" is marketed by Channel Master, Ellenville, N. Y. Price: \$79.95.



Battery-generator voltage indicator

This accessory meter comes with a complete kit and instructions for installing it on your car or boat. It is made in 6-, 12-, 24-, and 32-volt models for addition to any battery-powered electrical system. The Volt-i-cator is a suppressed-zero voltmeter with an expanded scale over the operating range. You can tell at a glance if your generator is working properly, whether your voltage regulator is properly adjusted, or if your battery is draining. The Leece-Neville voltmeter is available at local parts dealers for about \$13.

*Carl E. Weller,
the man who
took the wait
out of soldering.*



Have Gun —Will Solder

The instant-heat soldering gun is one of those rarities—a hand tool that was truly a new and needed invention

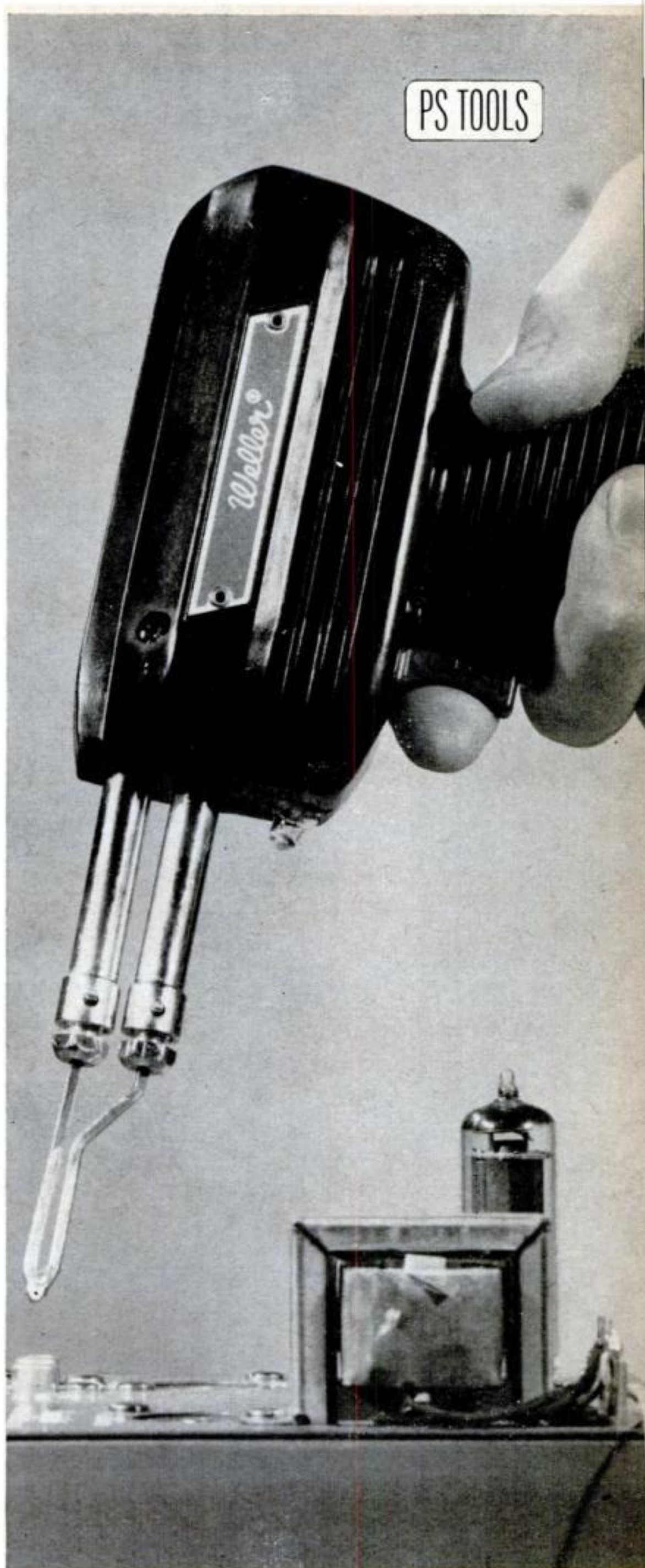
By Hubert Lockett

ANY good workman gets ideas on the job for tools that will make his work easier or faster. But few are able to parlay such an idea into a five-million-dollar business.

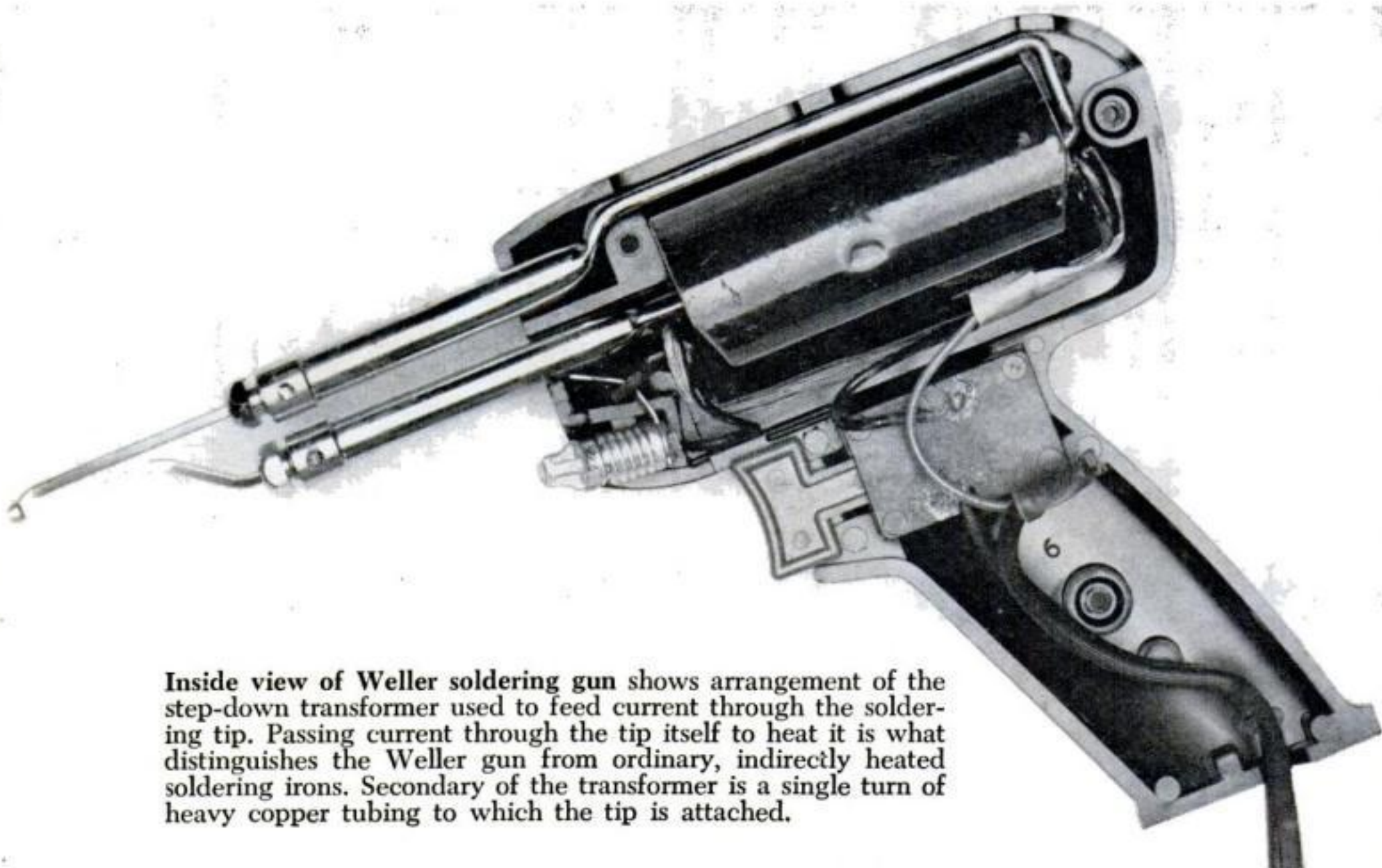
Carl Weller did it with his soldering gun.

Back in the Thirties, Weller was a radio repairman. The soldering iron was to his trade what the handsaw was to the carpenter, the mill file to a machinist, the Stillson to a plumber. But it was a time waster. In the shop you kept it hot all day to avoid waiting when you needed to make a solder joint. This meant frequent redressing

CONTINUED



PS TOOLS



Inside view of Weller soldering gun shows arrangement of the step-down transformer used to feed current through the soldering tip. Passing current through the tip itself to heat it is what distinguishes the Weller gun from ordinary, indirectly heated soldering irons. Secondary of the transformer is a single turn of heavy copper tubing to which the tip is attached.

or replacement of the tip. On house calls, you twiddled your thumbs while you waited for it to heat; and when you finished the job, it was too hot to put in the toolbox.

Probably there wasn't a man in the business who didn't dream of an instant-heating soldering tool. There were plenty who, like Weller, tried to invent it.

The basic difficulty with the conventional iron—its indirectly heated working tip—was correctly analyzed by many. Current flowing through a coil of resistance wire had to heat the wire first; then the hot wires had to heat the copper tip by thermal conduction. A lot of heat got soaked up before the tip reached soldering temperature.

More than one would-be inventor asked the right question: Why not use the electric current to heat the tip directly? But Weller got to the Patent Office first with the right answer as to *how*.

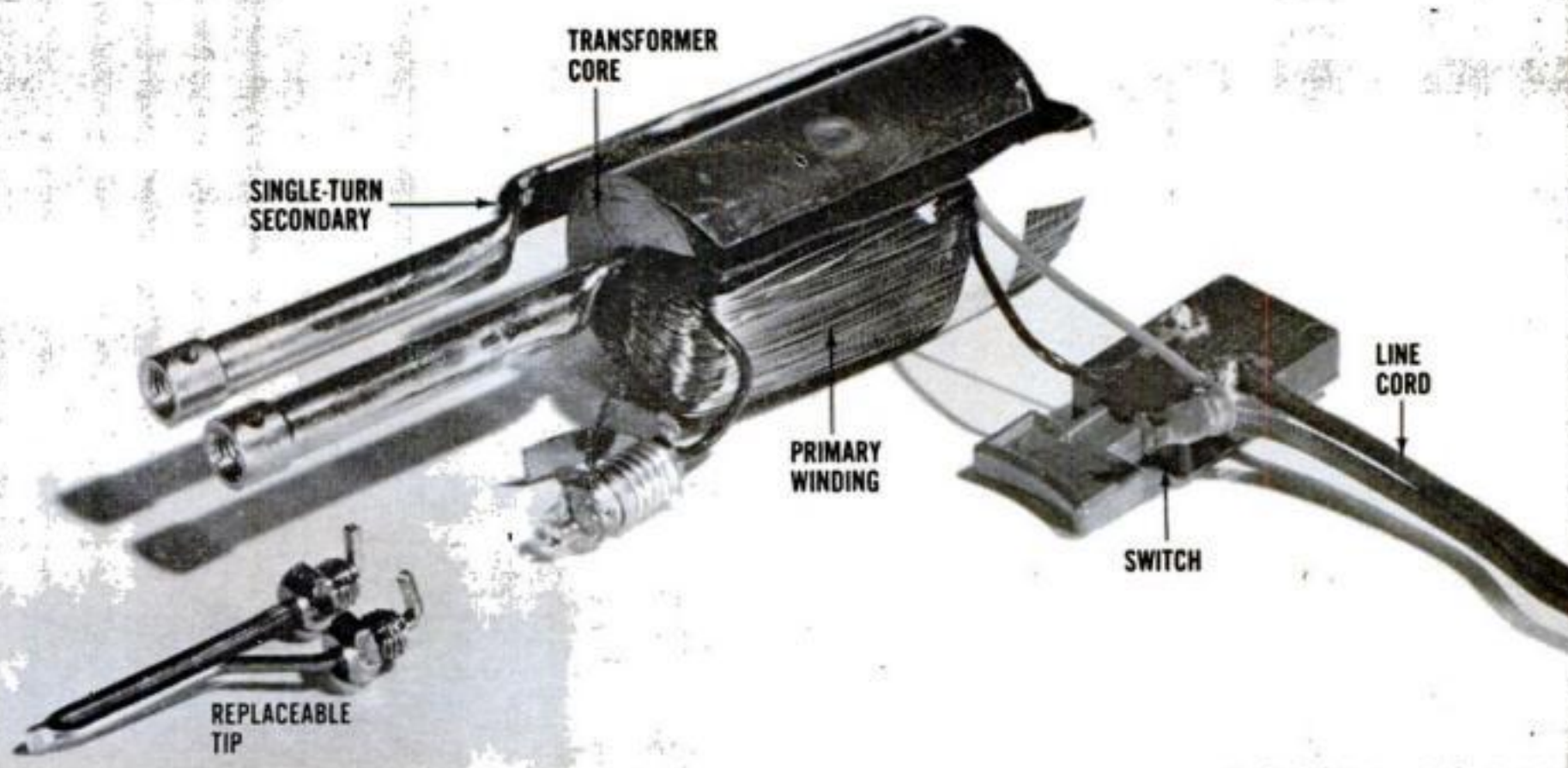
To understand the problems involved in inventing the soldering gun and to appreciate the elegant simplicity of the tool, you need to know something of the fundamentals of the soldering process itself. Soft solders form a bond by a solvent action. Part of the metal being soldered is actually dissolved by the molten solder and goes into solution with the solder to form an alloy different from the original solder. Join-

ing two pieces of metal by soldering is actually a chemical process rather than a purely physical one of adhesion.

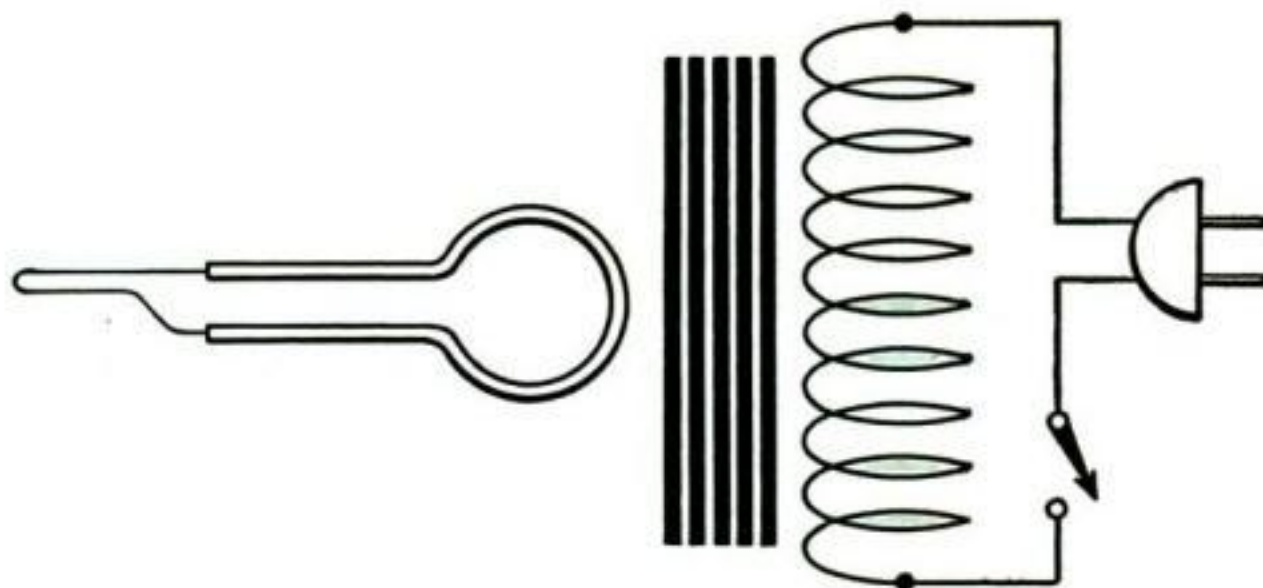
The role of the soldering iron or gun is not to melt the solder, as the common notion goes. The soldering iron's job is to heat the metal to be soldered to solder-alloying temperature. The metal must be kept hot enough to maintain the solder in a molten condition long enough for the alloying process to take place. (Of course, the molten solder must be in intimate contact with the metal; the metal surface must be clean; and a flux must be used to prevent formation of an oxide film on the hot metal.)

It is not enough for a soldering tool simply to get hot enough to melt solder. It must be capable of producing a sufficient *quantity* of heat to bring up to temperature the metal being soldered—and it must be able to transfer that heat efficiently and rapidly from the soldering-iron tip to the metal.

Imperfect understanding of these facts doomed many of the early attempts to make a direct-heating soldering iron. Because soldering irons—and most other electrically heated appliances—had always used a high-resistance alloy wire to obtain heat from electricity, the idea never occurred to would-



Coiled, flat ribbon of iron makes transformer core. To wind laminations through preformed wire coil, Weller invented a production machine. Real secret of gun's performance is copper-tubing secondary winding. It not only conducts heavy current without overheating, but acts as heat sink to cool upper end of hairpin tip and thus concentrate heat at soldering peen.



be inventors to try anything else. They tried to beat the warm-up time lag by using the resistance wire itself as the soldering tip to be applied to the work.

Some drawbacks to the scheme were recognized: With the current-carrying conductor in contact with the work, there was a shock hazard. Using a step-down transformer to feed a lower voltage to the resistance wire was a logical solution. But it couldn't be too low or there wouldn't be enough voltage to force enough current through the resistance to give enough heat. (Ohm's Law, $I=E/R$ —current equals voltage divided by the resistance; also, heating effect is determined by the equation, $\text{watts}=I^2R$.) So they still wound up with an uncomfortably high voltage.

But what really doomed this approach was something else: Alloys that make good resistance wire (poor electrical conductors) are also poor heat conductors. Although

the wire got hot enough, insufficient heat went into the metal to be soldered.

Weller, too, went through all these steps in perfecting his soldering gun—and ran into the same blind alley. Then his knack for ignoring the traditional solutions paid off. Instead of starting from the assumption that resistance wire was necessary to convert electricity into heat, he took off from the premise that a good heat conductor was necessary for the soldering tip. Practically, this meant using copper.

But no engineer in his right mind would even consider connecting a chunk of copper across a power line—it would be a dead short. The copper would get hot all right, but so would the connecting wires—hot enough to melt. Two problems had to be solved: 1) how to concentrate the heat at the soldering tip; 2) how to limit the current flow to a practical value.

[\[Continued on page 191\]](#)

These Dutch Boy House Paint Colors are different. Incredibly fade-resistant.

Starting now, you can use fresh, attractive colors on your house—from off-white to dark or bright—without fear of change or fading. That's because Dutch Boy Latex House Paint has a new kind of acrylic resin base, or "binder," which is much less sensitive to oxidation and ultraviolet light (the main causes of deterioration in house paints) than are the vegetable drying oils found in conventional paints.

Added to this, Dutch Boy Latex House Paint uses new types of color pigments, specially selected for stability.

And as it ages, there's no surface powdering to mask the color.

Put these three advantages together and it's easy to see why we can make this claim: Use Dutch Boy Latex House Paint without risk of perceptible color change, even after years of exposure.

In fact, Dutch Boy Latex House Paint retains its color so well you can come back and touch it up years afterwards and not see the difference. Think what that means in maintenance. To keep your house looking fresh and bright all you do is touch up the worn spots when they need it. In short, you may never have to paint your entire house at one time again.

You'll like using Dutch Boy Latex House Paint. (For all the reasons why, read what's on the back of the next page.)

A product of National Lead Company

**Now you can paint your house any of these colors.
They're all fade-resistant Dutch Boy Latex House Paint Colors.**



Sun-Ray Pink



Cobblestone Gray



Bermuda Coral



Soft Blue



Warm Beige



Sandstone



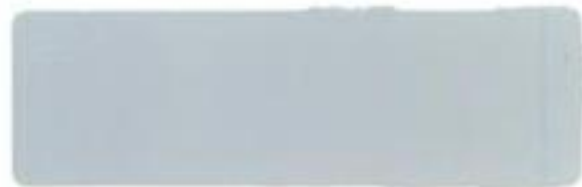
Laurel Green



Light Beechwood Beige



Winter Wheat



Soft Gray



Desert Pink



Slate Blue



Cream



Gulf Aqua



Gunsmoke



Cascade Green



Cape Cod Yellow



Moss Green



Light Cream



Beechwood Beige



Caribbean Aqua



Balsam Green



Apple Green



Spring Willow



Quarry Gray



Rancho



Provincial Yellow



Woodland Oak



Charcoal Gray



Woodlawn Green

Save this card and keep it until you're ready to paint.



Dutch Boy Latex House Paint not only gives you color that lasts, it does much more:

It stays bright. Tests have shown Dutch Boy Latex House Paint to be outstandingly resistant to sunlight and oxidation. In fact, this paint retains its color so well you can touch it up years afterwards and not see the difference.

Cuts painting costs. The extremely high hiding power of this acrylic latex paint means it spreads further than conventional paints. You need less paint. And because the tough latex film has outstanding resistance to chalking and weathering you won't need to repaint for many years.

You don't have to wait for the weather. No need to wait for a dry spell to start painting. You can even use it right after a rainstorm if you like.

Covers almost any surface. It's the only paint you need for wood, stucco, brick, galvanized iron, aluminum, concrete.

Goes on more easily. Just like indoor latex paint, Dutch Boy Latex House Paint is astonishingly easy to use. And you can throw away all those cans of thinner. People, brushes, equipment all clean up with soapy water.

Leaves no lapmarks. With this paint you can stop, start, and stop again and no one will see the difference. This means you can spread your house painting over weeks if you like.

Like more facts about this remarkable paint? Ask your Dutch Boy dealer. He's in the Yellow Pages.

New Plastic-Mending Cements

how they work
and how
to use them

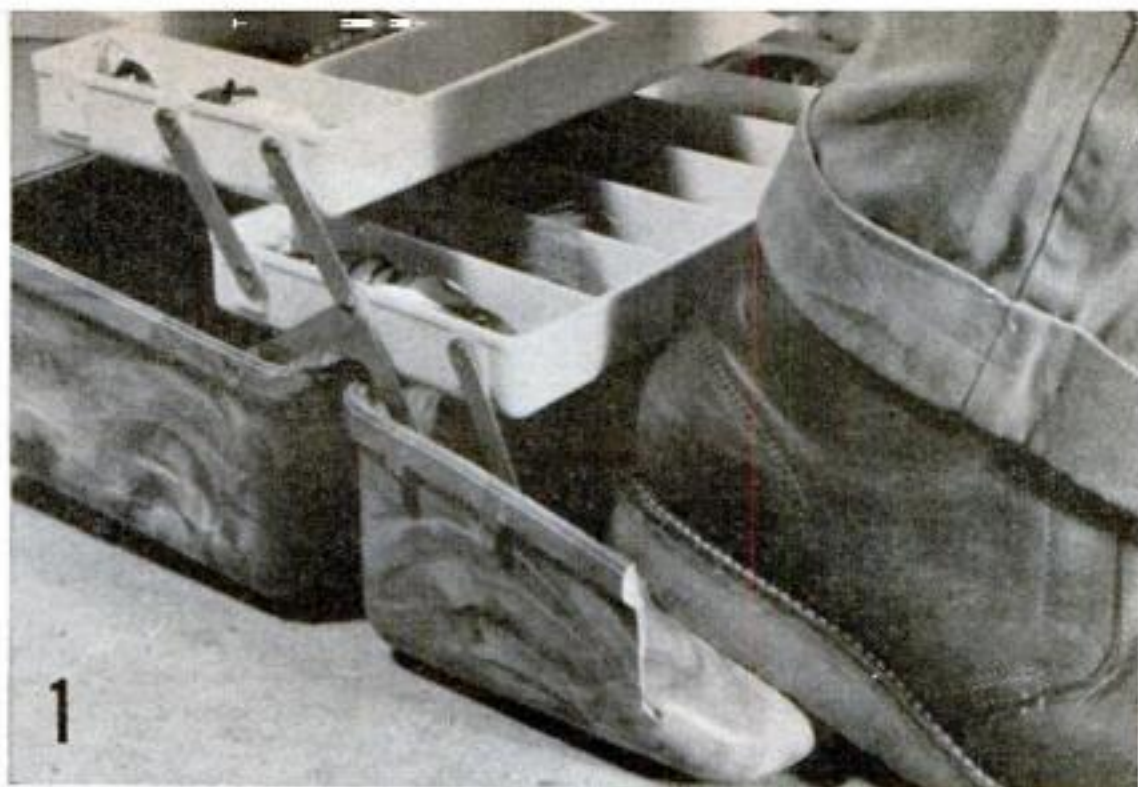
By Jackson Hand

THIS year, refuse-collection men should find fewer plastic objects in the household debris. Reason: A new adhesive now makes plastic repair routine. Acrylic, styrene, vinyl, phenolic—sheet or molded—rigid or flexible—all the common plastics (except polyethylene) respond.

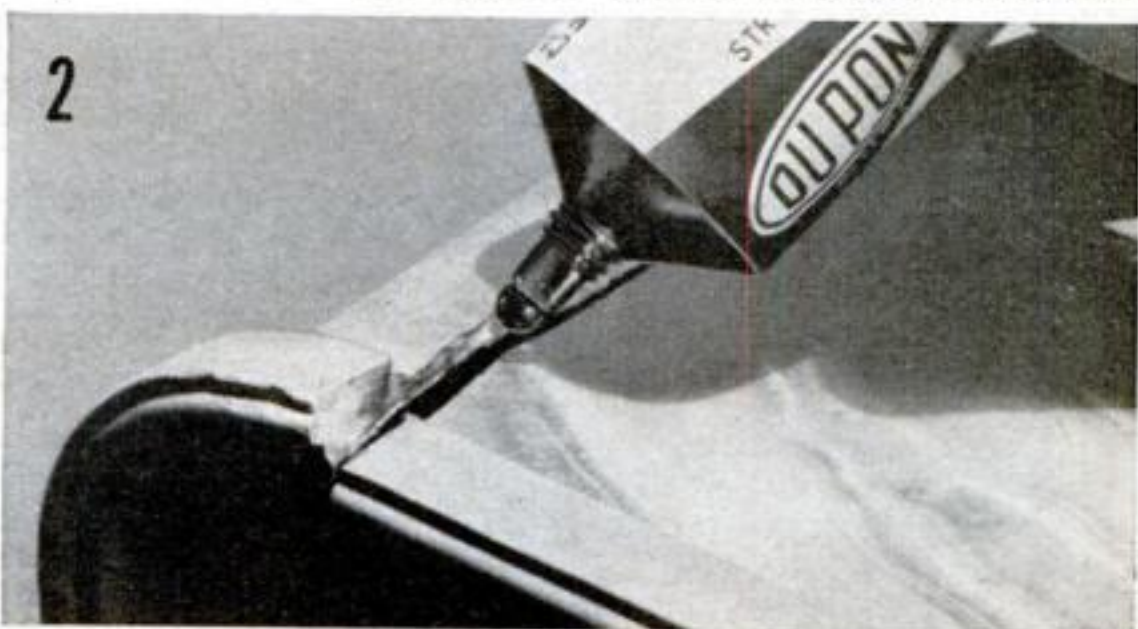
Time was, when everything made of plastic was eggshell-easy to break. But most of it was so junky that it caused little pain to throw the stuff out. Then came expensive radios and cameras of plastic, car upholstery, rainwear, swim tanks. A hole in one of those put a big hole in the pocket. And there was no cure; nothing seemed to mend them permanently.

Now, for about 70 cents, you're in clover. The cements may be either viscous (like

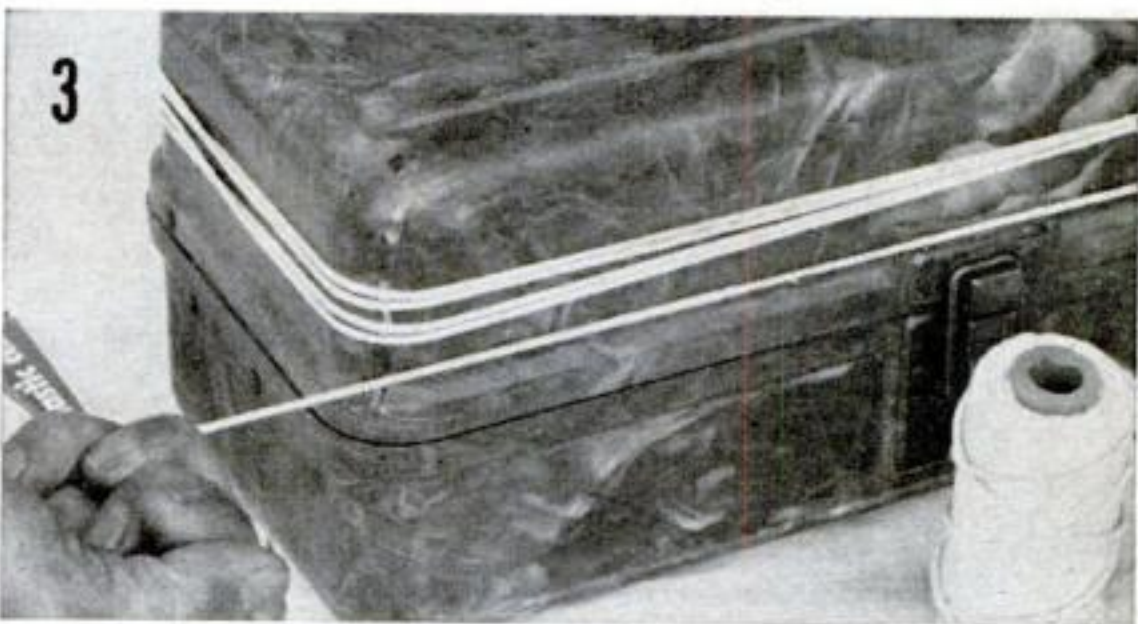
CONTINUED



Oops! Even an "unbreakable" plastic box has limitations.

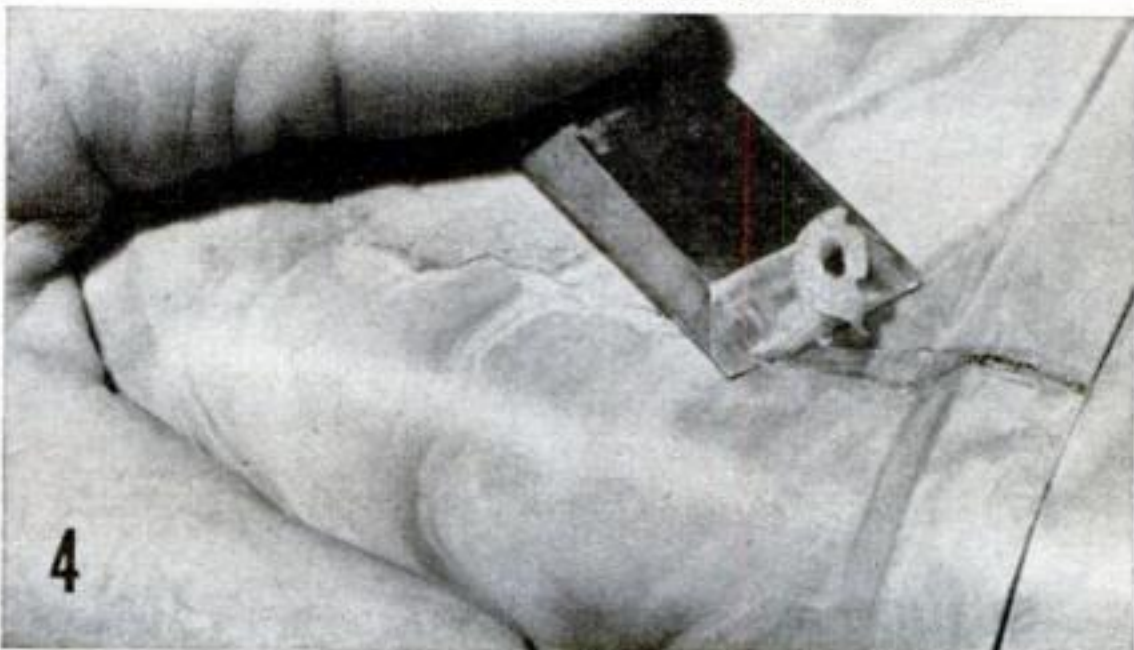


To repair, coat both edges of break with plastic cement.



Bind with strong cord or rope and let stand to cure.

Shave off excess cement with a chisel or razor blade.



Du Pont's Plastic Cement) or relatively thin (like Devcon's Plastic Mender). Both kinds take 24 to 48 hours to cure thoroughly—all the solvents must evaporate before the residue becomes solid. With rigid plastics, or metal and glass, even longer curing is better.

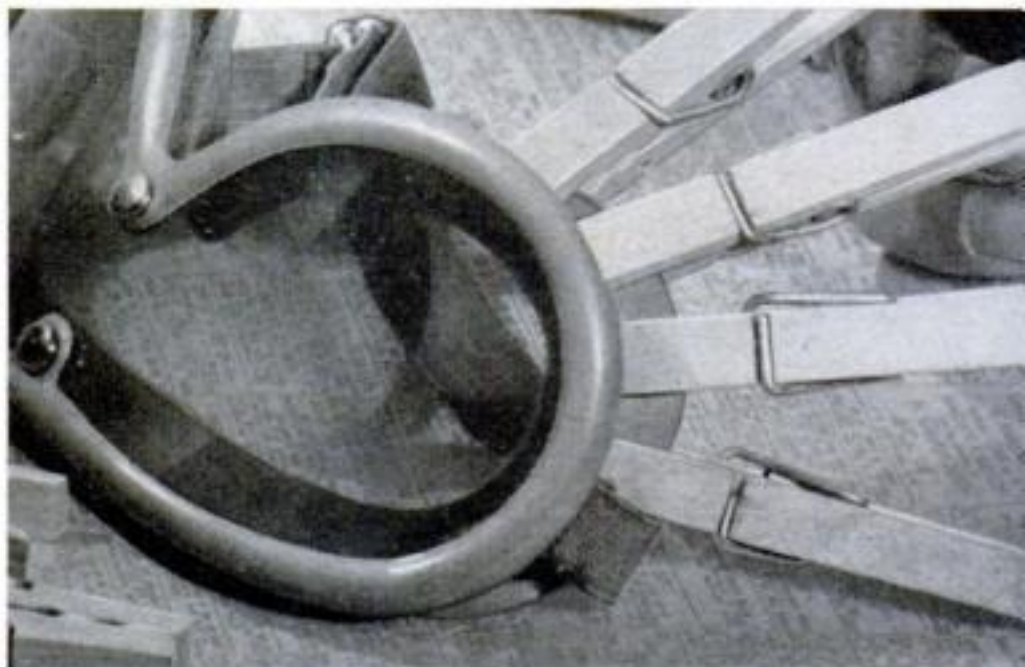
At first whiff, the new cements may remind you of "household cements." But the similarity is only whiff deep. The plastic cements are far more complex. A blend of several solvents, they'll soften a wide variety of sheet plastics without curling the material too much. There's no softening of hard plastics, but the resins in the cement bond tenaciously to them. And the plastic cement decides which solvents to send into action—you don't even have to know what plastic you're mending.

Always make sure surfaces are clean. On some types of vinyl, the surface may have a chalky appearance. Wiping with a soft cloth—or gently sandpapering—will help.

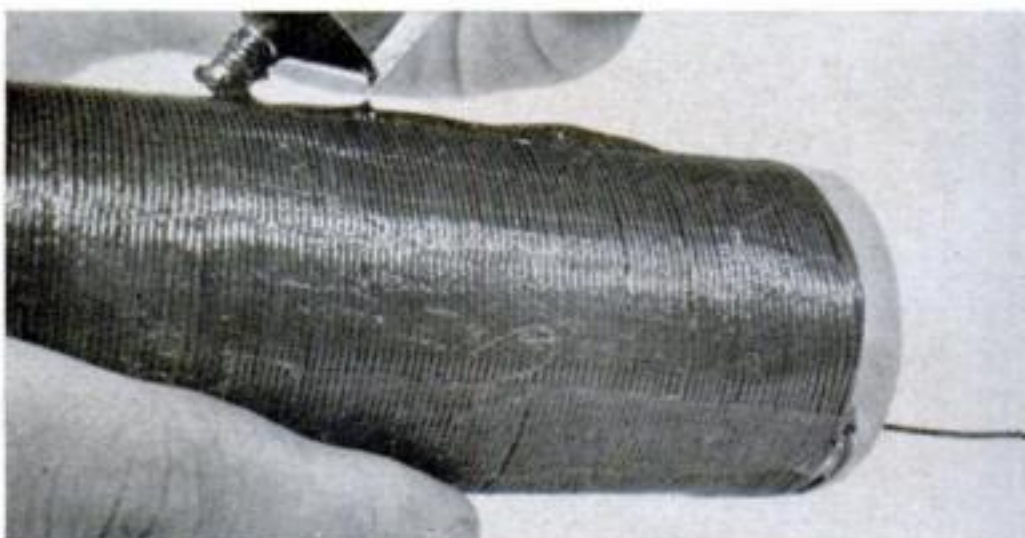
To test before a repair, squeeze a drop of cement in an inconspicuous place. If 24 hours later the drop stays stuck, go ahead with the mend. If the drop peels or rubs off easily you may be up against one of the stubborn plastics.

The plastics that can't be mended with the new cement are rare. Polyethylene may balk—but 99 times out of 100 when it's plastic, plastic cement will fix it.

Try these how-to tips when you're



Always immobilize bonded parts until cement has cured. Clothespins are good to hold continuous seams of semirigid and soft plastics.



To bind windings of rope, cord, or wire (as in this electrical coil), pour a line of cement along the top so that it runs between the coils.

Shop Notes on the New Plastic Cement

Plastics that you're unable to mend with plastic cement include: polyethylene, Teflon, silicones, nylon, Delrin acetyl plastic, and polypropylene. Although plastic cement may make some of them sticky—gummy on the surface—neither it nor anything else available to consumers will make them *stick*.

Plastic cement is easy to use, yet there are certain mistakes that can lead to failure. Experimentation has developed techniques that help guarantee good results:

- Apply the cement to both joining parts—and no fooling. Chemical wetting of the surfaces is important. You must not expect one side to wet the other, for a skin starts forming almost immediately and interferes with the transfer of cement.

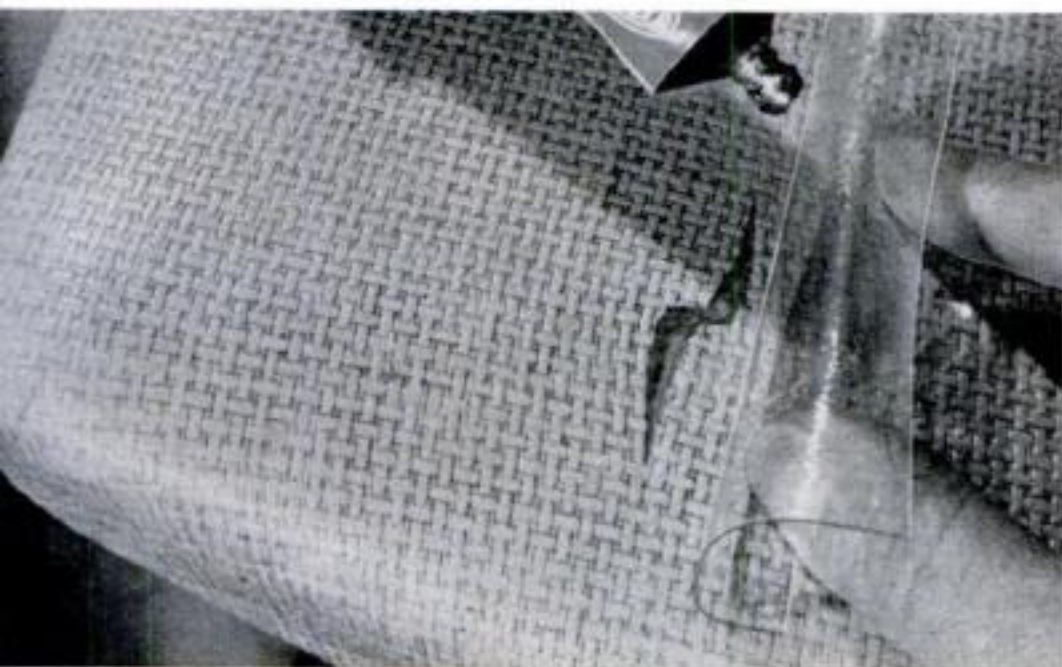
- Keep the joined parts immobile until the cement has completely set. This is important because the solids are weak, without elasticity, between the time the solvents evaporate and the resins harden. Do not test the joint to see if it's holding.

- Clamping is not essential, and often impossible. But plan how to maintain immobility—clothespins, tape, or rubber bands. Even gravity will sometimes do the job, when the piece is stationary.

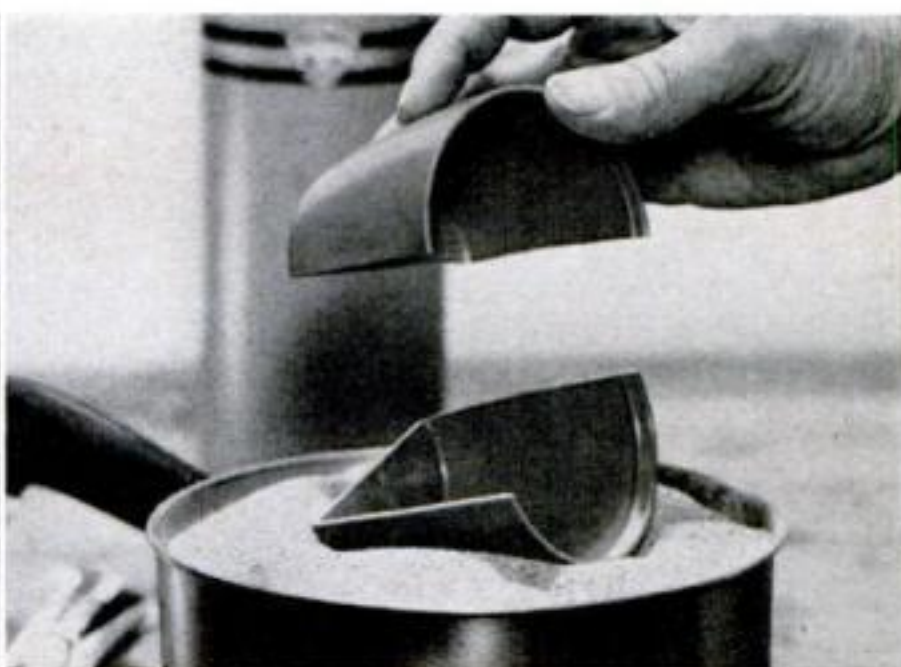
- Work for the thinnest possible glue line, not only for good looks, but to make the best joint. When you cement thin sheet materials, use cement sparingly to prevent wrinkling and curling. Otherwise it's harder to position the parts and hold them together.

- Molded, rigid plastics can build up stresses during the original hardening and curing. When they break, the stresses distort the edges, so the pieces fail to fit back together precisely. Binding with cord or rubber bands often will pull the stressed edges into contact. Give it extra time to

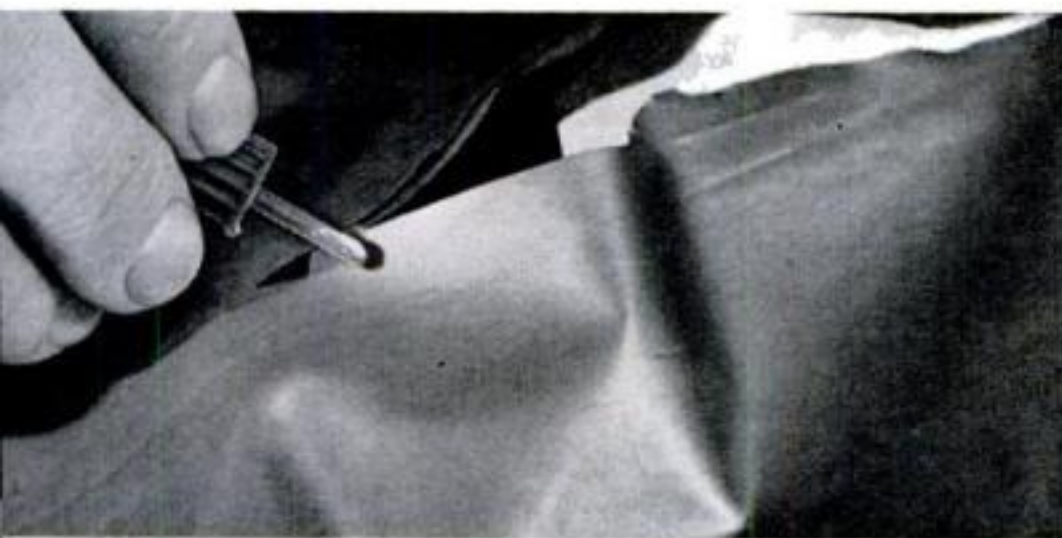
working with plastic cement



Need an easy repair for a rip in upholstery or other plastic fabric? Apply cement around the tear and patch with a clear plastic film.



To mend irregular shapes that roll or teeter on a flat surface, brace them in a pan of sand as you work, and during the curing stage.



When mending seams in plastic rainwear, press them together and hold them a few seconds. They'll usually hold without clamping.



Aluminum foil keeps cement off fingers. Leave pad a while to avoid disturbing the mend. Don't wait too long, and it peels off easily.

cure, or the stresses can break the joint. If the joint requires excessive pressure to close, try filing or paring the plastic.

- Don't expect miracles—just good adhesion. You may be able to peel a lapped joint of sheet plastic. But, in actual use, the strain on a lap joint would be tensile shear, not a direct pull. When a sheet is lapped only a tiny amount, the joint, if stretched, will be as strong as the material. But it will tear as easily as the material, too. Butt-edge joints in molded plastic, similarly, will not withstand flexing—but flexing is not the normal strain.

- When you're cementing to such impermeable materials as glass, metal, and phenolic plastics, you must allow a long time for the resins to cure, since the solvents will evaporate slowly. A glass bond, for example, may take a week for ultimate strength, although it will be strong enough for gentle handling in 48 hours.

- Some brands of plastic cement are packaged with a small patch of sheet material. You can add to this frequently in-

adequate supply with small pieces trimmed from excess material at the seams, or from certain kinds of plastic bags. Even when the item is colored, or patterned, clear plastic makes an invisible job.

- Excess cement on sheet patches is usually invisible. Any excess on molded or rigid work is easy to trim off with a razor blade. After it has hardened several days, you can sand and polish the cement solids that remain. When hard, the cement is a close chemical cousin to Lucite, and you can handle it the same.

- The shrinkage, as the solvents evaporate, is relatively great. So don't expect to fill gaps with plastic cement unless you build up enough to gain a smooth surface.

- One of the basic solvents in the cement is toluol. Along with others, it presents some hazards. The wet cement may mar the surfaces of furniture and the polish of some plastics. Keep it away from them for at least 48 hours. The solvents dry the skin. To keep your skin from cracking, avoid prolonged contact. ■ ■

what's new

PHOTOGRAPHY

Zoom-lens movie camera is all automatic

The new Minolta Zoom 8 includes features that are fast changing the habits of movie fans. Four inexpensive penlight batteries power the camera. Each set will last through 10 to 12 rolls of film.

A sensitive cadmium sulfide meter sets exposure automatically. It adjusts to the field covered by the zoom lens. The meter can be disengaged for manual control.

The camera has through-the-lens focusing, and either right- or left-hand control of the 10-30mm f/1.8 Rokkor lens. A ground-glass center screen aids focusing,

and a pointer in the finder shows exposure. For remote control, you remove the hand-grip and plug in an accessory electric cord. Price of the new Minolta: \$159.50.



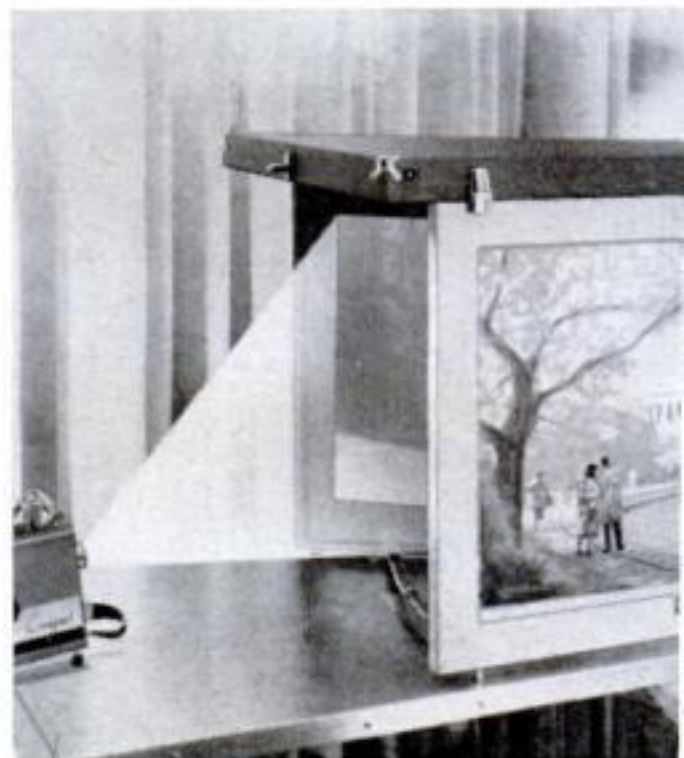
Auto-load 8mm projector at a moderate price

For the budget-minded, Bell & Howell offers the automatic-threading 8mm movie projector shown above. The 256 includes forward, reverse, and still controls on a single lever. The gear-driven reel arms fold flat for storage. There's a built-in film cutter. Price: about \$80.



Rapid-sequence flash gun holds five AG bulbs

Flip a finger and this doughnut-shaped flash gun bangs off five AG bulbs in quick succession as a spring-operated revolving magazine advances new bulbs into shooting position. Clear and blue interchangeable prismatic lenses give even light. \$11.95. Kling Photo, NYC.



Rear-projection screen folds flat in case

This portable rear-projection screen is large enough—18" by 24"—for group showings of up to 50 people, yet folds flat into a 3"-by-24"-by-31" case. The Groupshow operates with any projector. Price: \$95. Hudson Photo Industries, Irvington on Hudson, N. Y.

PHOTOGRAPHICALLY SPEAKING

By Bob Hering PS PHOTO EDITOR



Questions about Polacolor? Here are the answers

We decided to devote this month's column to answering questions that readers are asking about the new Polacolor film. The chances are that by now your local dealer has received a limited supply of the film. Polaroid tells us they expect the film to be available in limited quantities throughout the country by mid-May. Some dealers, of course, may be unable to fill the demand.

If you're still wondering just what's needed to convert your Polaroid camera for color, check the chart below. It summarizes Polaroid's recommendations.

Starter pack. Polaroid markets a starter pack that includes two six-print rolls of Polacolor, slip-on cutter-bar "teeth," and detailed instructions for your camera model. Type 48 pack (3¼" by 4¼") sells for between \$9 and \$11; Type 38 (2½" by 3¼"), \$7.50-\$9.

Film speed and developing time. Polacolor is unlike conventional color. The camera temperature affects the processing time and film speed of Polacolor. At first this may be confusing. You can, however, move from a heated room to cooler outdoor temperature, shoot a picture, and return immediately to process it, using normal film speed and developing time. You should avoid processing below 45 degrees. In general, above 60 de-

CONTINUED



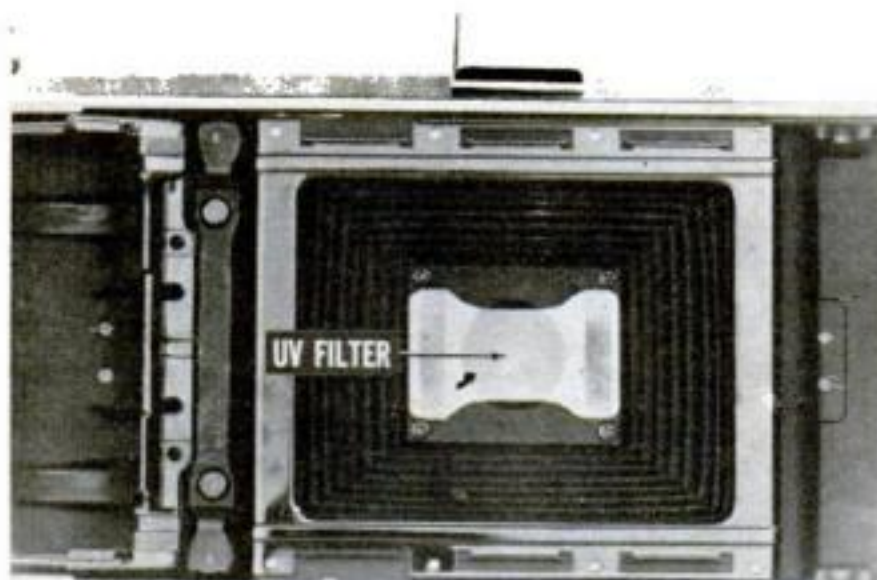
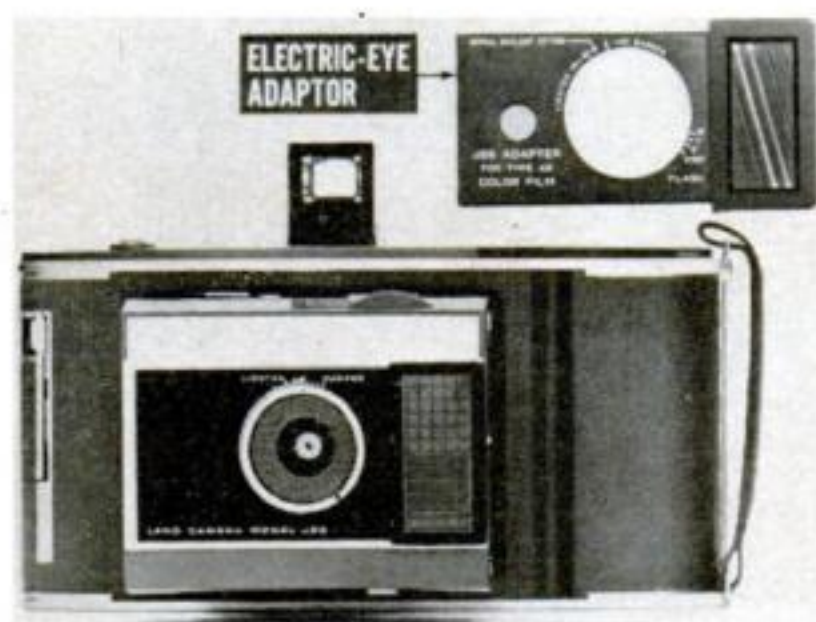
What You Need to Take Pictures with Polacolor				
CAMERA MODEL	FILM TYPE	NECESSARY ACCESSORIES	FLASH GUNS AND BULBS FOR INDOOR PICTURES	RECOMMENDED ACCESSORIES
95	48 (3¼" x 4¼")	Cutter-bar teeth #274	#200, 201, 202—press 25B (blue); #270—M3 (white)	Processing timer #120 Polaroid exposure meter #625 or other meter
95A, 95B, 100, 700	48 (3¼" x 4¼")	Cutter-bar teeth #274 or 274L*	#200, 201, 202, 203, 240—press 25B (blue); #270—M3 (white); Wink-light #252 and flasher—AG-1B (blue)	
110	48 (3¼" x 4¼")	Cutter-bar teeth #274	#221, 222—press 25B (blue); Wink-light #251 and flasher—AG-1B (blue)	
110A, 110B, 120, 800, 150, 160	48 (3¼" x 4¼")	Cutter-bar teeth #274 or 274L*	#281—5B (blue); Wink-light #250 and flasher—AG-1B (blue); #269—M3 (white)	
850, 900	48 (3¼" x 4¼")	Cutter-bar teeth #274 or 274L*	Wink-light #250 and flasher—AG-1B (blue); #269—M3 (white)	Processing timer #120
J66	48 (3¼" x 4¼")	Cutter-bar teeth #274L; #660 color-adaptor kit**	J-5 flash reflector—M3 (white)	
J33	38 (2½" x 3¼")	Cutter-bar teeth #273L; #330 color-adaptor kit**		
80, 80A, 80B	38 (2½" x 3¼")	These cameras should not be used with color film until they have been modified by the factory.		
*Both versions are packed together			Note: Polaroid Print Copier cannot be used with color film.	
**Contains electric-eye adaptor. UV filter. J-5 flash reflector				

PHOTOGRAPHICALLY SPEAKING

degrees, use a film speed of 75 ASA and develop for 50 seconds. For precise results, use this table:

TEMPERATURE	SET METER TO ASA	DEVELOPMENT TIME
100°	100	40 seconds
75°	75	50 seconds
60°	50	60 seconds
45°	25	90 seconds

Coating. When I first tested Polacolor several months ago, I had to coat the print no less than five seconds after removing it. This was tricky. The film muddied quickly.



Polaroid fortunately put through a crash program to eliminate the coating step.

Filtration. Polacolor is a daylight film balanced for 6,250 degrees K. Indoors you must use blue flash bulbs, clear bulbs with a blue shield, or electronic flash. You can use the same filters for this film as you do for conventional daylight color films. Later, when production experience eliminates the variables, Polaroid will give specific filter suggestions. Meanwhile, if you wish to experiment with changing the overall color, try one or more CC filters for almost any color correction. ■ ■



New finder shows left-right heading

A new transistorized direction finder features a left-right meter indication of the boat's heading. It also has an automatic noise limiter and circuitry for reception of new Consolan signals. It operates on three bands: beacon, standard broadcast, and marine. Price is \$249.50. Sonar Radio Corp., 73 Wortman Ave., Brooklyn 7, N.Y.



Easy-to-install motor tilt

New Tilt-O-Matic clamps on the transom and, at the push of a button, instantly raises and lowers the outboard motor. It's powered by a rechargeable CO₂ cylinder that gives approximately 50 complete tilting cycles. Price: \$74.50 for the standard model, \$89.95 in chrome. National Marine Corp., 114 West Indiana Ave., South Bend, Ind.



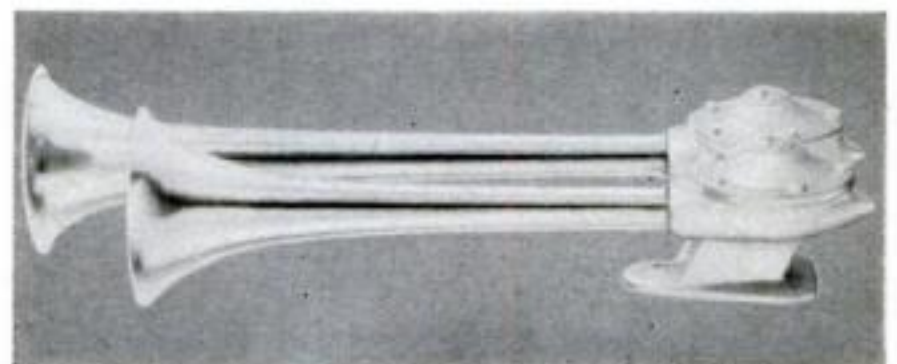
New Aluminum Engines Cut Weight in Half

THE new all-aluminum Graymarine engines reduce engine weight by half. Weighing in at as little as 390 pounds (for installation with MerCruiser outboard drive), they are ideal for stern-drive installations such as the Eaton PowerNaut shown above. This stern-drive model with Graymarine fresh-water cooling system and all hydraulic gear is only 490 pounds. The V-8s are built in two output sizes: 136 hp. with two-barrel downdraft carburetor, 160 hp. with a four-barrel downdraft carb. The engines come with a 40-amp marine alternator, heat exchanger and sea-water pump, disposable canister-type oil filter, and fuel filter. Prices vary with horsepower. Gray Marine Motor Co., Detroit 7.

A rocket for your pocket



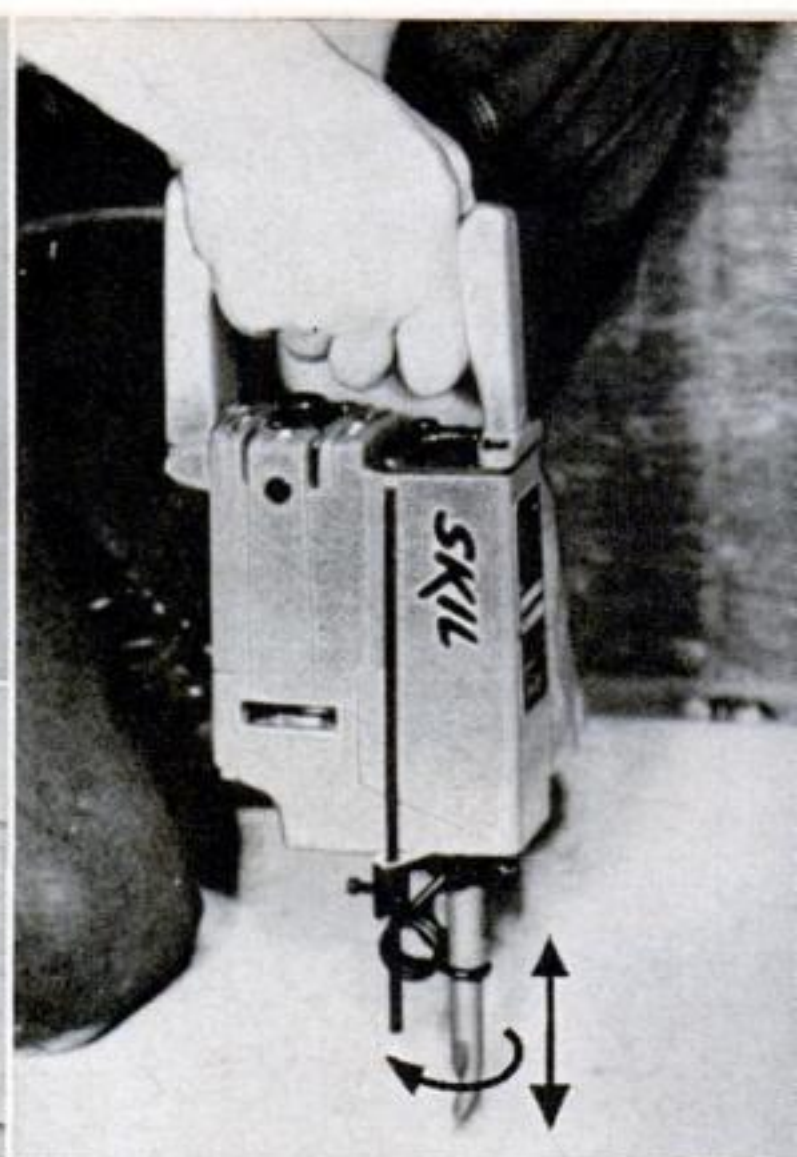
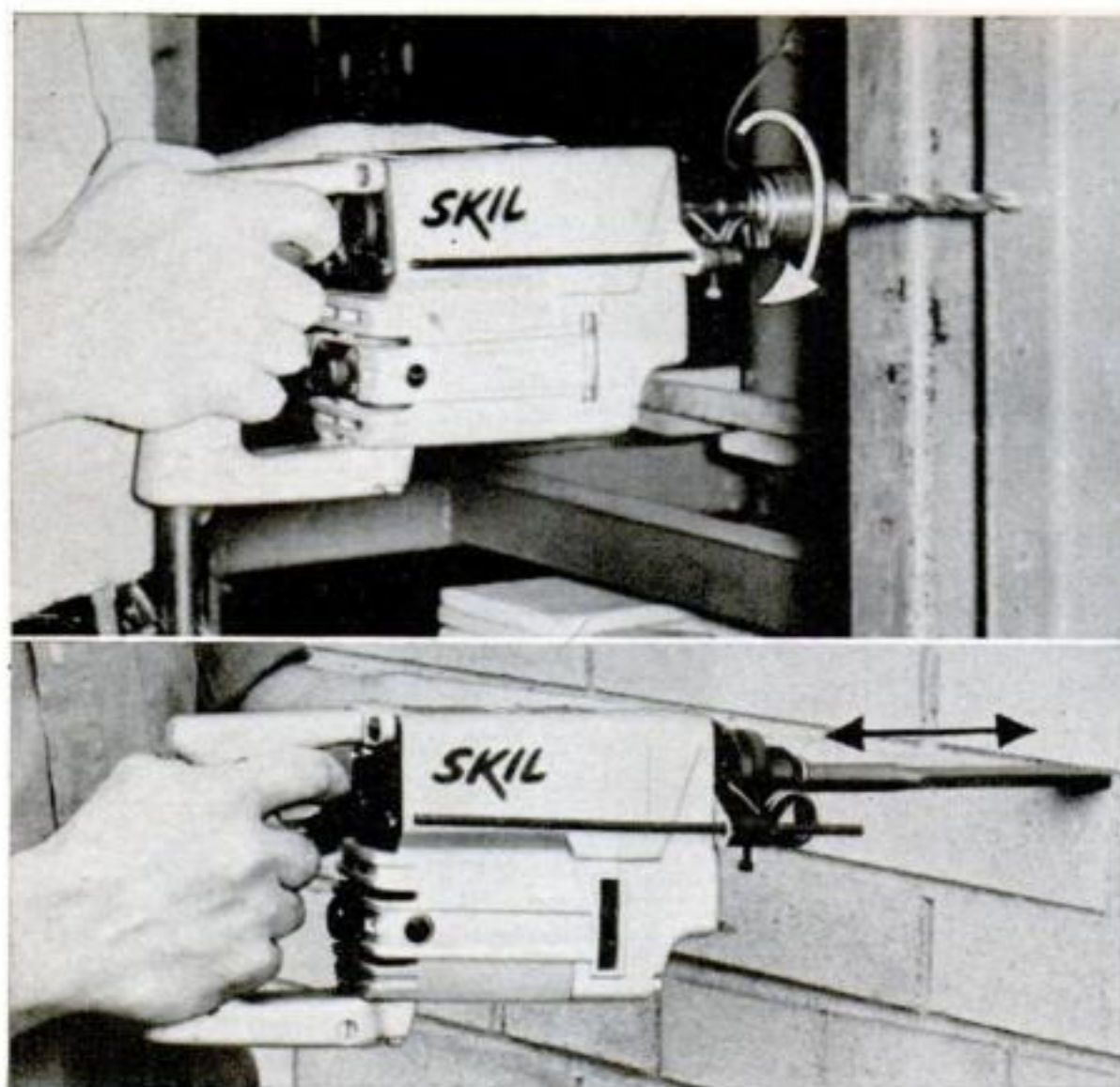
A new pocket signal-flare pistol is only 5" long, $\frac{1}{2}$ " in diameter, and weighs 1 $\frac{1}{4}$ ounces. The cartridges load easily, fire flares to an altitude of 300 feet. Price is \$15.95 pre-paid for a kit including flare pistol and nine cartridges (three each of red, green, and white). Scot-Air, Inc., 6451 Main St., Morton Grove, Ill., sells the kit.



Small horn with big voice—Freon blows it

A new horn for boats of all sizes has a "liner's blast" although it measures only 16 $\frac{1}{4}$ ". It's powered by a two-pound Freon cartridge, activated by a solenoid-controlled valve. Price is \$29.50 from Hadley Mfg. Co., 2221 Albion St., Toledo, Ohio.





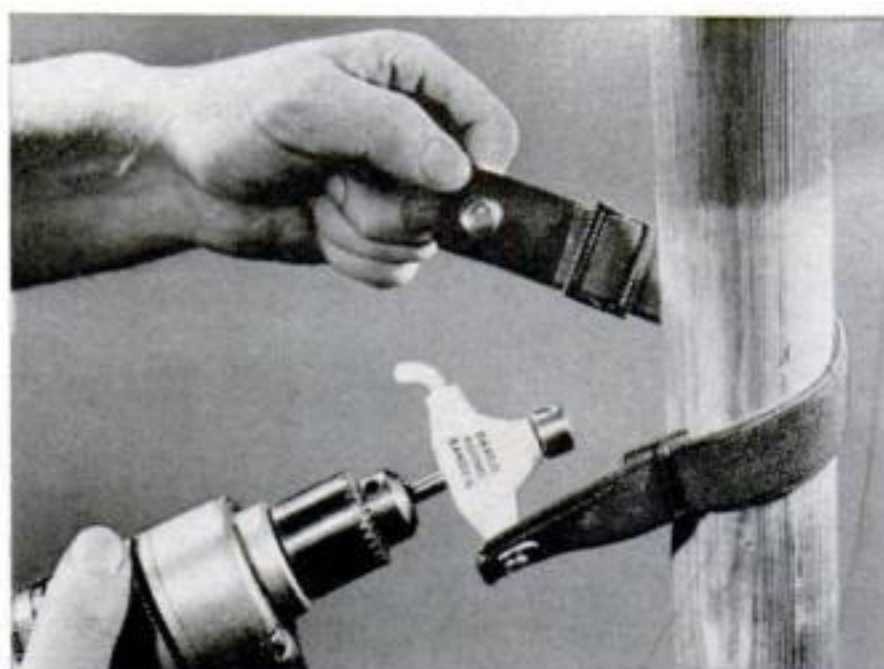
Triple-Action Tool Drills, Hammers

Lightweight Roto-Hammer combines rotating and hammering actions. A rotating cam alternately compresses and releases a spring. To use combined action (above, right), the spring's energy drives bit in and out at same time it rotates. For rotary action only (top, left), a special adaptor engages the rotary drive but not the spring. For hammering (lower, left), another adaptor engages spring but not rotary drive. Tool is designed for jobs where larger hammers are not practical. Price is \$169.50. Skil Corp., Chicago 30.



Portable drill kit saves steps

For the home craftsman who wants all the accessories for his electric drill in one kit, the Toter tool kit should save many steps. It includes such accessories as a grinding wheel, nine twist drills, 3" wire brush, paint mixer, polishing bonnet, tool stand, and sandpaper disks. Price: \$9.95. Wen Products, Inc., Chicago 31.



Sanding belt for a portable drill

Fasten a strip of common sandpaper to the Barco flexible sanding belt, attach it to your $\frac{1}{2}$ " portable drill, and you have a rapid sanding tool for smoothing curved surfaces. Adjustable clips hold sanding strip on neoprene belt. The sanding belt has a short, straight-line, back-and-forth action. \$4.95. P. L. Bahr Co., Box 246, Vienna, Ohio.



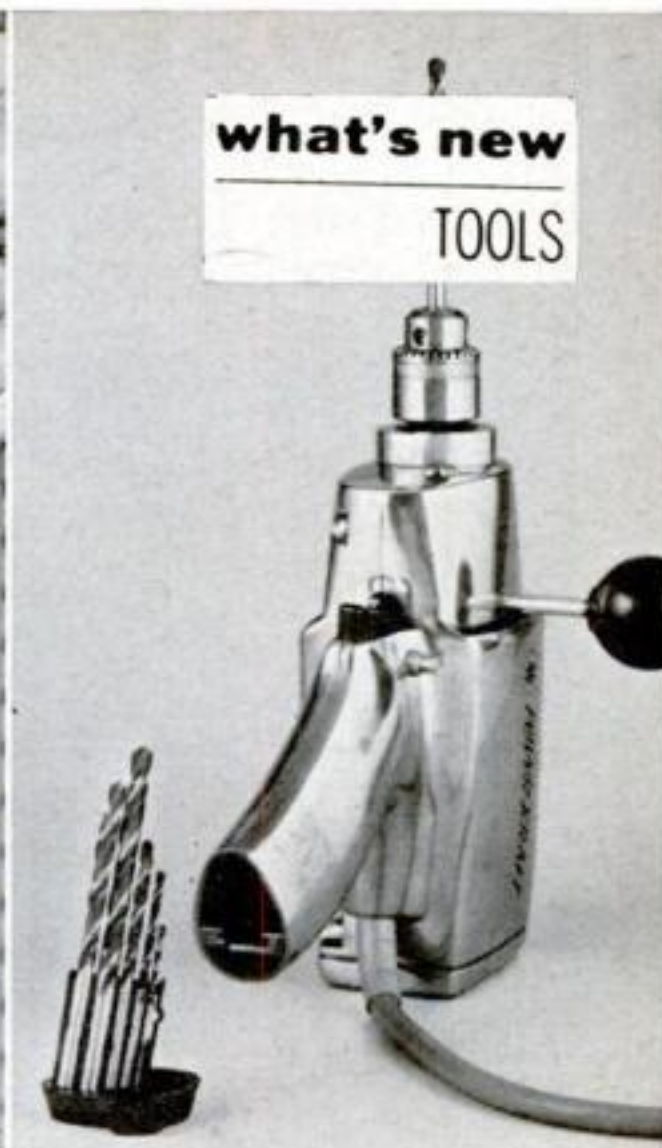
New electric stapler speeds tacking jobs

The Duo-Fast stapler sets up to 300 staples per minute. Designed for use where compressed-air supply is impractical, tool runs on house current. \$85. Fastener Corp., Franklin Park, Ill.



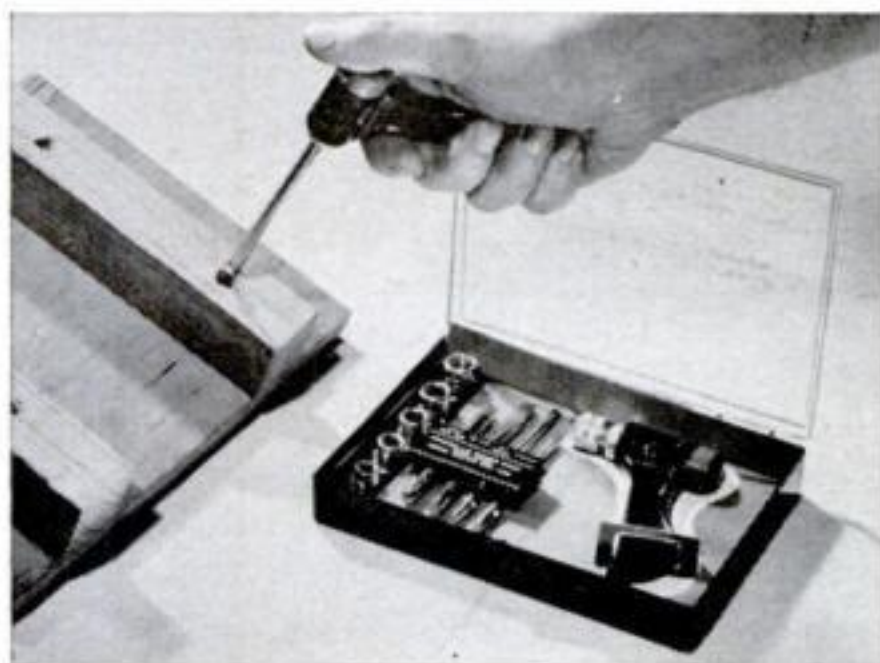
Locking hooks give more stability

Self-locking pegboard hooks reduce side wobble and resist pull-out. A special spring clip is a part of every hook. Six hooks in a plastic pack cost 49 cents. Peg-Lok, Inc., Cumberland, R. I.



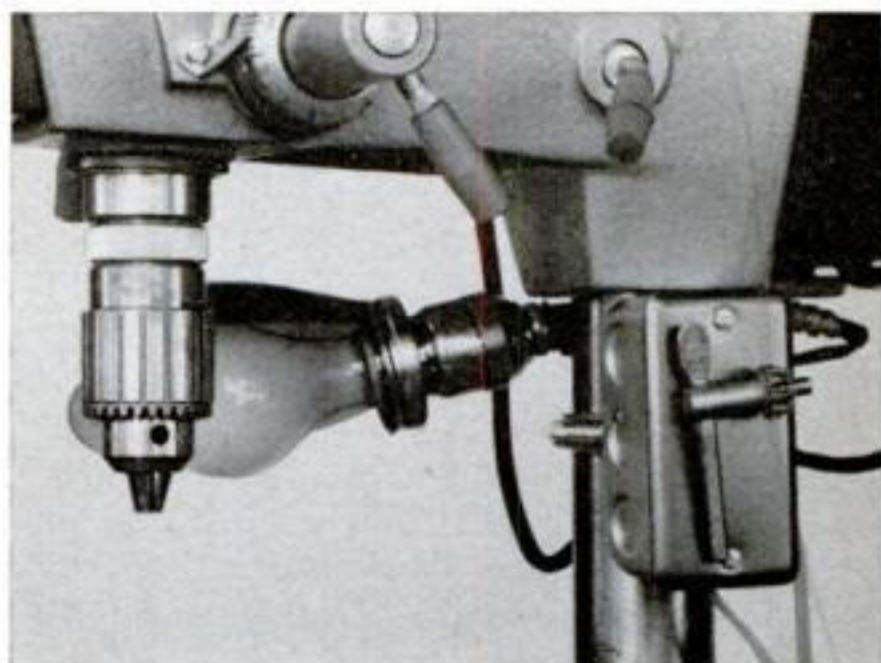
Electric-drill handle holds extra bits

A plastic cartridge for the new Powr-Kraft $\frac{1}{4}$ " drill holds 10 standard-size bits and snap-fits into the handle. Its end is the butt plate of the drill. It sells for \$21.88 at Montgomery Ward.



Reversible pistol-grip screwdriver

Handy for working in tight corners or at odd angles is Oxwall's new pistol-grip ratchet screwdriver. A flick of the finger changes the action to left, right, or neutral. The pistol-grip handle increases turning power. Five-piece set, \$1.98. Ten-piece set, including sockets, \$2.98. Oxwall Tool Co., Flushing, N. Y.



Switch averts flying chuck keys

With this attachment, the chuck key must be placed on a safety switch before the motor will start. Two magnets hold the key securely. It makes a safety interlock, eliminating the possibility of a forgotten key flying off and hitting someone. Switch sells for \$8.95. Ellison Instrument Co., 65 E. Route 14, Crystal Lake, Ill.

I Drove a Jeep "on the Moon"

[Continued from page 92]

veloped now. Storage batteries, possibly recharged by solar cells, could power electric motors. Special wheels, already designed on paper, could negotiate rugged mountains and deep moon dust.

What still stumps the engineers is a purely human problem: tailoring the remote controls to the "drivers." Guiding a vehicle electronically is extremely demanding, as I discovered during the seven runs I sweated out.

I first tried a low-speed (1.4-m.p.h.) and a medium-speed (3.1-m.p.h.) trial, both without time delay, as a warmup. It was unlike anything I'd ever tried before. There was a stick instead of a steering wheel, a constant-speed governor instead of an accelerator pedal, a flickering picture instead of direct vision, a rigid stool instead of a seat that moved with the weaving jeep. And no brakes.

Even so, the first two runs weren't too hard. At low and medium speed there was time to correct mistakes.

The feedback lag. The 2½-second delay introduced an irrational, nightmarish quality to my earthbound lunar trip.

Practically everything we do with our hands has an immediate result. A delay in the familiar cause-effect pattern causes uneasiness and frustration. Furthermore, the learning process is severely impaired by a lag in feedback; by the time you see the effect of your last action you've forgotten exactly what the action was.

Hagerman and Bill Obert-Thorn, a human-factors specialist at Grumman, have been trying a variety of control arrangements. They soon learned that the fewer tasks a driver has to perform, the better—for him and the vehicle.

They selected three constant speeds on the basis of trial runs—1.4, 3.1, and 4.25 m.p.h. A driver could then concentrate on steering, since speed was outside his control. An actual moon vehicle, however, might have a speed control so it could scurry over long, flat stretches.

Steering could be the familiar proportional type—in which the wheels turn at an angle proportional to the angle of movement of the control device. Or it could be "bang-bang"—an all-or-nothing type in which the wheels point only straight, hard right, or hard left.

Finally, the TV camera was rigged so it

could point ahead or pan with the wheels. This made 12 possible combinations.

My first experience with the time delay was at medium speed (3.1 m.p.h.) with proportional steering and fixed camera. I ran over five cones and went on the wrong side of four others.

The second run was also at medium speed with proportional steering; but the camera was linked to the front wheels to pan with them. This time I clobbered six cones, but stayed inside all the others.

Though this was better than my previous showing, I found the pan effect distracting. The camera seemed to swing over too far. And while it was aimed to one side I lost sight of the windshield latch, which I had been using to aim the jeep.

The third run, described earlier, was at high speed (4.25 m.p.h.) with proportional steering and fixed camera. I flattened two cones, outflanked two others.

On the fourth run I surprised myself and my Grumman mentors. This was a medium-speed, bang-bang steering, fixed-camera combination. With bang-bang the amount of deflection was constant at 30 degrees. I had to worry only about duration of the turn. Instead of shoving a clumsy stick, I flicked a small toggle switch. My score: one cone down, none outflanked.

High-speed, bang-bang. My fifth, and last, run was a high-speed, bang-bang, no-camera-pan combination. I really blew it. Whether from overconfidence, fatigue, or heavy ignition interference from a plane taking off nearby, I couldn't tell. But I squashed six cones and went on the outside of another.

I climbed out of the darkened trailer convinced that they had better provide plenty of replacements for the Lunar Roving Vehicle—and its driver. But Hagerman assured me he was working on a driving aid that would overcome the time-lag handicap.

"It's a mechanical analogue computer for constant-speed, bang-bang-steering control," Hagerman said. "It will superimpose a spot on the screen that indicates the jeep's position 2½ seconds later, based on present course and speed. You steer the spot instead of the front of the vehicle."

Even with such a predictor, moon-vehicle drivers will be busy, harried men. But here's one volunteer. Talk about armchair adventuring!

"Even squaw can carry"



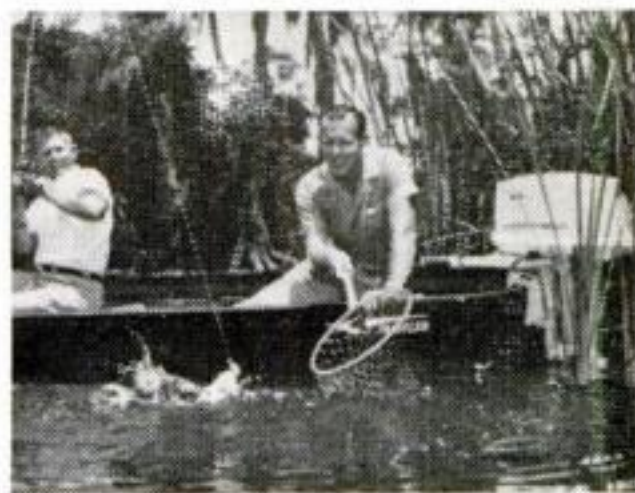
New Johnson Compacts

So dependable, they all have a 2-year warranty!

Above is the Sea-Horse 3. Home in the teepee are three other power-packed papooses: the 18 (at right), 10 and 5½ hp models.

The spunky 3 has a built-in fuel tank plus, as a new accessory, a fuel pump and separate 6-gallon tank to boost cruising time to 17 hours. The 18, 10 and 5½ offer thermostatic cooling, super silencing, cushion-hub prop and built-in gear shift.

The same 2-year warranty policy — *good for parts and labor* — also applies on the new 75, 40 and 28 hp models. For free catalog, write: Johnson Motors, 1364 Pershing Rd., Waukegan, Illinois. Division of Outboard Marine Corp.



How to Fit Out a Corvan as a Camper

[Continued from page 124]



a private vehicle and can go anywhere.

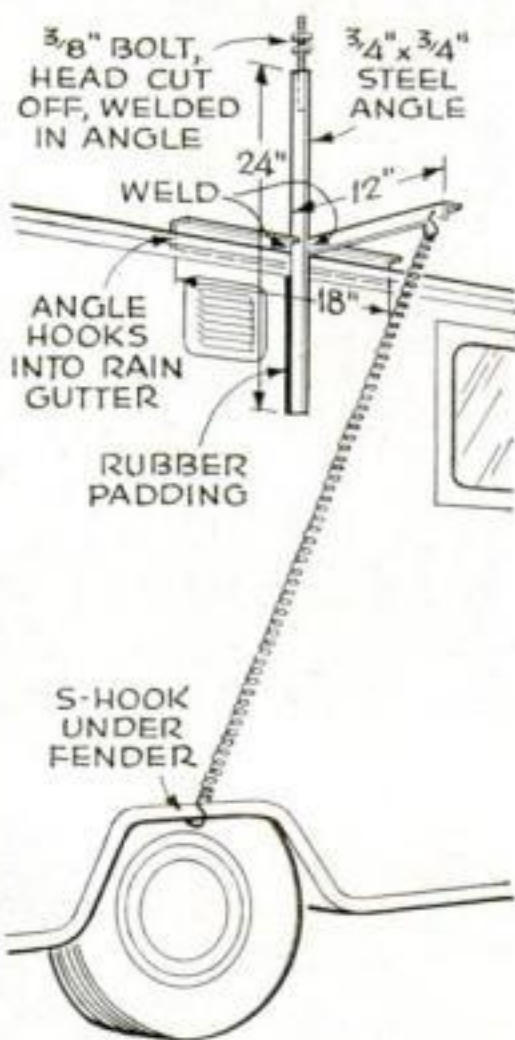
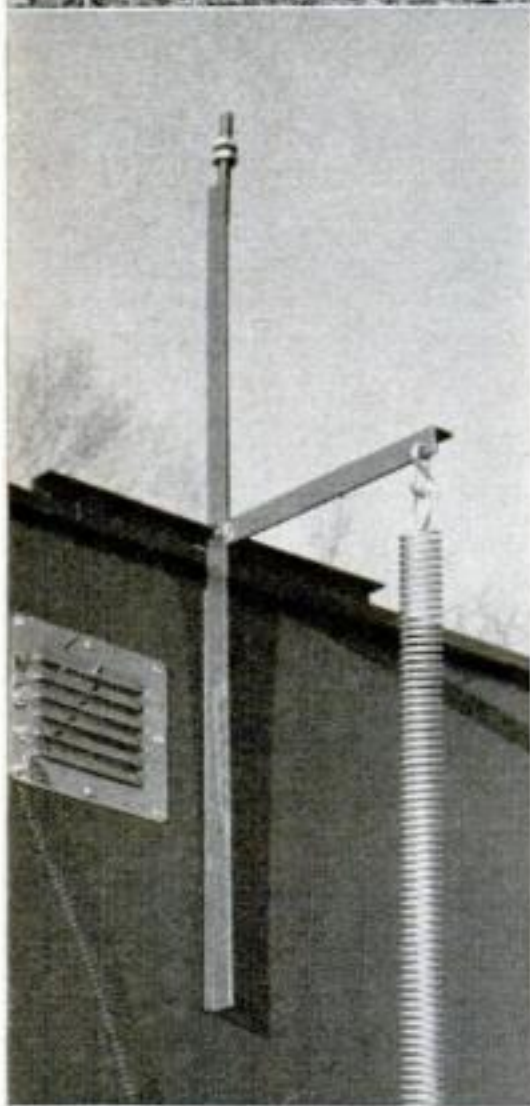
The installation job turned out to be easier than anyone guessed. Stock windows are available for this purpose at shops that handle auto glass and supplies. They consist of rubber moldings that simply hook into place after openings have been cut and framed in the van walls. How they work is shown in a drawing. Chatman added four in all—two on the door side and two in the opposite solid wall.

Fitting out the inside. Chatman decided to keep the furniture simple. Instead of elaborate built-ins, he chose a large ready-made dresser that provides 10 drawers of storage and fits across the van behind the front-seat partition. Its top serves as a counter.

Only one bed is permanently installed, and this doubles as a sofa by day. The other bed is set up on a folding plywood support that raises its front end level with the higher cargo deck at the rear. Both beds have 4"-thick foam-rubber mattresses.

For cooking, there's a two-burner propane stove and a portable charcoal grill. Other equipment includes a 10-gallon water tank, chemical toilet, small gas heater, and two plastic ice coolers—one for food, one for cold drinks. Washing is done in a plastic basin. A drain hole cut in the floor lets you dump dirty water through a funnel without going outdoors.

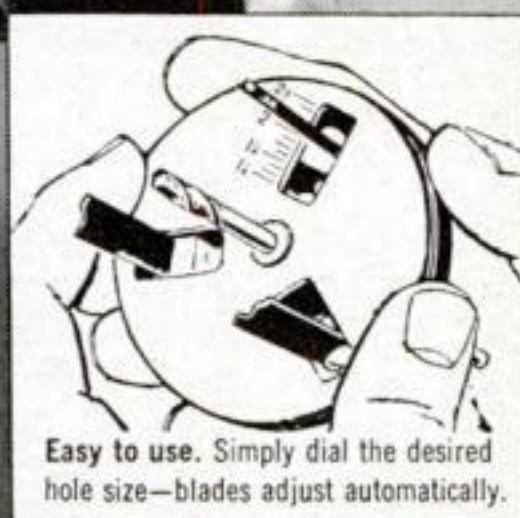
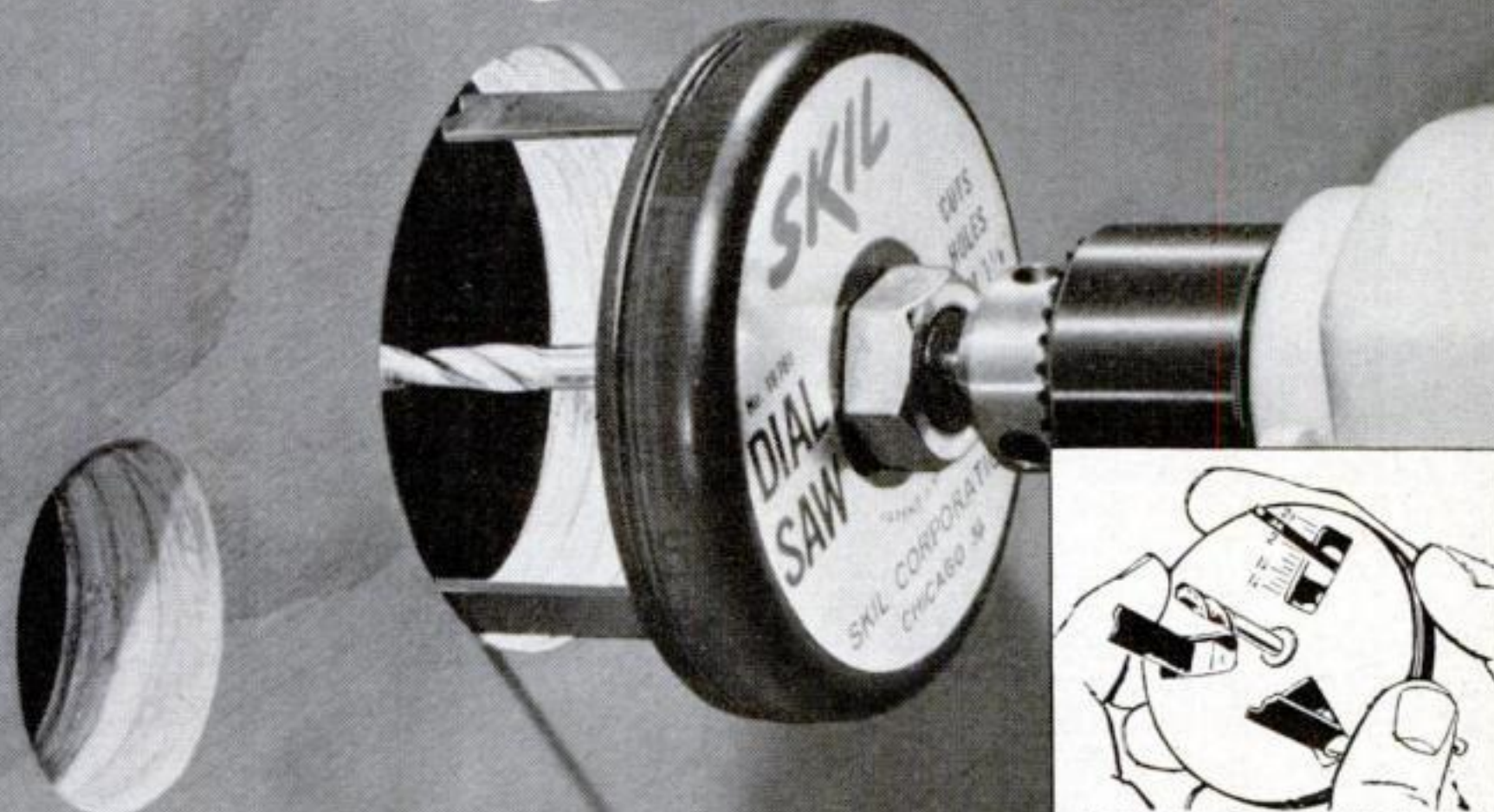
A 110-volt outlet on an extension cord is kept handy for plugging into power lines available at public campsites and trailer parks. With this, you can run a toaster, hot plate, electric shaver, lights, power tools—any standard household appliances. The interior is kept ventilated by a marine-type deck vent mounted on the roof and an exhaust fan on a rear wall. A two-section hinged panel at the top of the forward partition can be closed for privacy or opened to give the driver an unobstructed view through the rear of the van. Roller shades on the windows give full privacy throughout the camper. ■ ■



Rear edge of awning is supported by ingenious brackets that hook into the rain gutter. They're held in place by tension of long springs hooked under the fenders. Two nuts at the top allow the awning to be adjusted up or down until its edge fits snugly in the gutter.

FREE! \$495 DIAL SAW

for drilling holes 1 1/8" to 2 1/2"...



with any of these powerful Skil drills!

Model 503D 1/4" Drill has a full 2.5 amp. motor that provides power to spare for drilling in concrete, metal, brickwork, plaster, wood or wallboard. Lightweight — only 3 lbs. Priced under \$20.



Model 560D 3/8" Drill has double reduction gears, powerful motor for greater drilling torque. Side handle gives extra control, removable when drilling in tight spots. Priced under \$35.



Model 541D 1/2" Drill — Most compact, low-cost 1/2 inch available. Gives big drill performance with small drill handling ease. Powerful 3 amp. motor, multi-ball thrust bearing for heavy-duty work. Removable side handle. Priced under \$37.



SKIL
POWER TOOLS

Prices slightly higher in Canada.

You'd need a dozen or more attachments to cut the range of hole sizes made by this remarkable Skil Dial Saw.

Dial any size from 1 1/8" to 2 1/2". Cut through wood, wallboard, plastics and compositions.

The Dial Saw is yours *Free* with any of the three Skil drills illustrated. But don't wait. This is a limited time offer available at most hardware and lumber dealers.



WRITE FOR FREE SKIL POWER TOOL CATALOG

Send to Skil Corp., 5033 Elston Ave., Chicago 30, Illinois.

Name

Address

City Zone State

Dept. 514-E

They Fish for Diamonds

[Continued from page 87]

bles and water is lighter than the water outside the pipe, it flows upward—with such force it's carried high above the surface.

Meanwhile, nozzles on a "jet head" at the pipe's lower end squirt water jets downward. They stir up the sea bottom's gravel, and it gets drawn along with water rushing up the pipe.

At the top of the air lift the waterborne gravel starts through the barge's concentrating plant.

First it hits a "scalping screen" that strains out rocks and pebbles larger than $\frac{3}{8}$ inch in size. Back to the sea they go—after close scanning on a moving belt, in case of a huge diamond among them.

Next comes a "dewatering screen." It catches all the material to be concentrated—diamond-bearing gravel larger than 2 mm. (about .08 inch). Sand and water passing through this screen are rejected.

The gravel goes to an ultramodern "cyclone" separator that whirls it in a medium simulating a heavy liquid—water and ferro-silicon powder. Heavy minerals, diamonds included, sink to the bottom and are drawn off. Light ones (tailings) rise to the top.

In a ball mill, shells and other friable material of the heavy-mineral "fraction" are now ground up and screened off as sludge. Pleitz jigs, long used to recover diamonds from desert sands, eliminate as much remaining foreign matter as machines can. Then the paydirt goes to keen-eyed sorters who pluck out the gems.

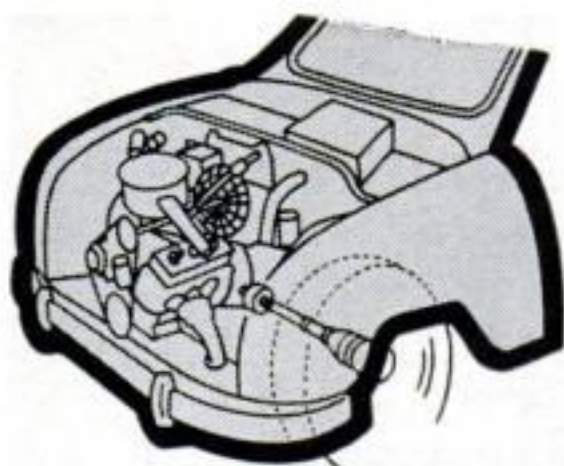
The undersea stones are definitely of gem quality. For its rough, uncut gems, Marine Diamond gets about \$40 per carat.

How did the diamonds in the sea get there? Asking that question is a good way to start a debate among geologists.

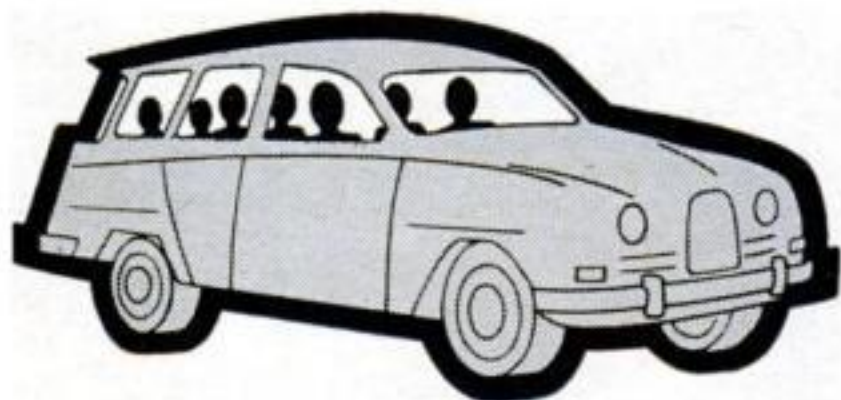
On land, diamonds occur in "pipes" of blue-green kimberlite rock—the volcanic lava that brought them to the surface—and in alluvial beds, where rivers carried them from the weathering pipes. Did rivers, ancient or modern, deposit the diamonds now being mined offshore? Or were submarine pipes the source of the sea-bottom gems, as Marine Diamond's chief geologist suggests—and, perhaps, of the coastal beds, too?

Which answer may be right doesn't trouble Sammy Collins. Smilingly examining the choice stones in Seventy Seven's latest haul, he observes, "We are quite pleased with the whole operation." ■ ■

1963 SAAB ... built so well



SAAB WAGON PERFORMANCE is the envy of many sedans. Reasons: Simple, effective engine—a quiet, three-cylinder, two-stroke valveless unit—produces all the power of a conventional "6." At high speeds, it operates with gas turbine-like efficiency, yet delivers from 30 to 35 miles per gallon. Front wheel drive; eliminates sway, minimizes skidding, and optimizes over-all stability. Front wheels pull the rest of the car firmly and effortless—around curves and corners, over mud, ice, and snow.

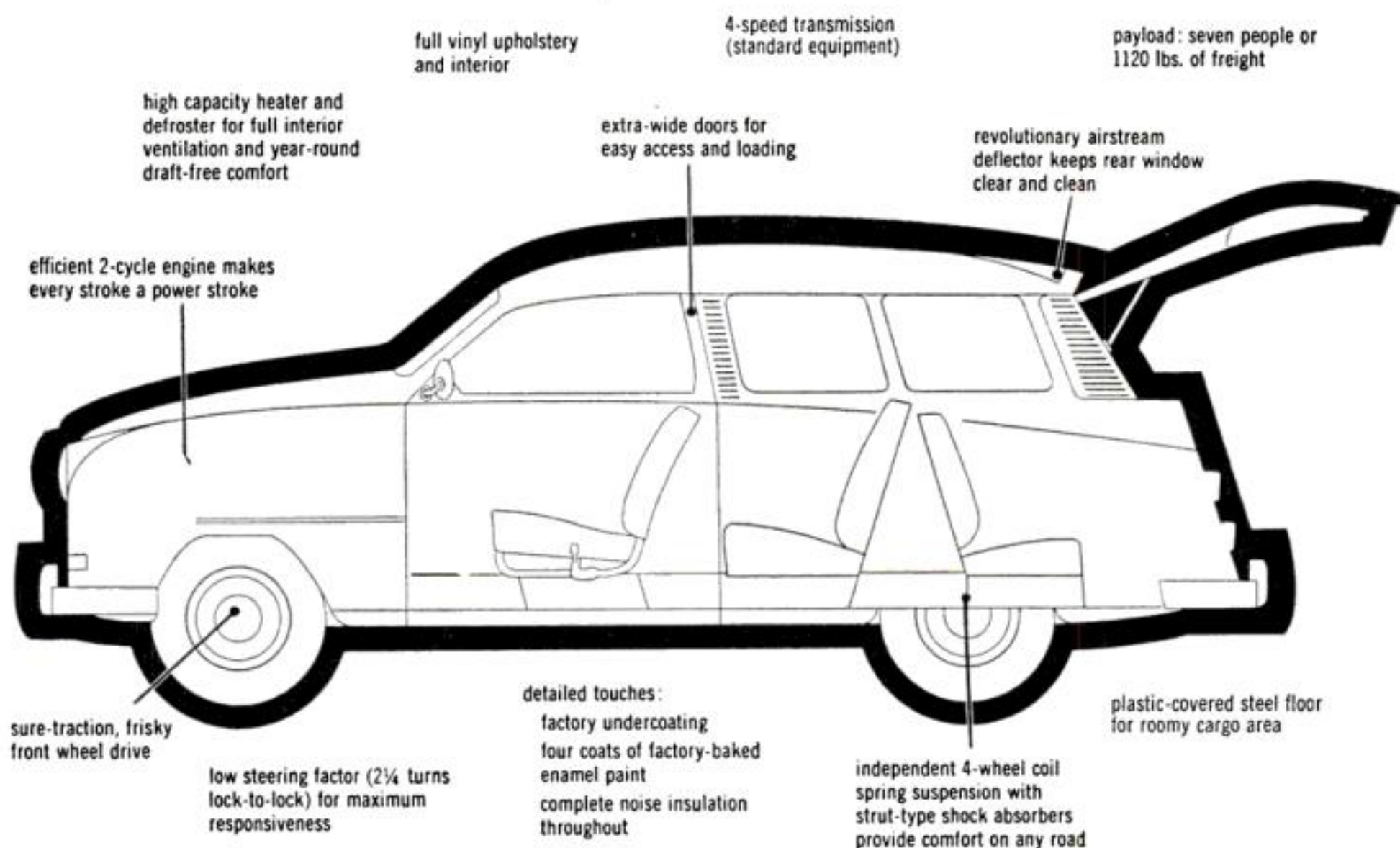


SAAB COMFORT AND CONVENIENCE are extraordinary. You—and six passengers or more than $\frac{1}{2}$ -ton of freight—ride in total comfort. Sleek aerodynamic design plus full major body panel and firewall insulation virtually eliminate noise. Unique air stream deflector—based on aerodynamic design—keeps rear window clear and clean. Efficient heating and ventilation system provides all-season comfort, keeps all windows fog-free. Bonus: You get \$265 worth of accessories as standard equipment on a SAAB.



SAAB IS SAFETY ENGINEERED Driver and passengers ride encased by a practically uncrushable steel airfoil on wheels. The rigid unitized body shell utilizes 18- to 20-gauge steel (heavier than most American cars)—throughout. Additional steel panels brace the engine compartment. A built-in crash bar (usually on racing cars only) completely surrounds the windshield, providing tremendous extra strength where you need it most, making SAAB one of the safest station wagons you can drive.

that it has a 24,000-mile/24-month written warranty*



Take a critical look at the new 7-passenger SAAB station wagon

Aircraft reliability and performance standards are blended with an entirely new approach to over-all automotive design in the Swedish SAAB 95 station wagon. This car was built to be better, not different . . . built by one of Europe's leading aircraft manufacturers . . . built

for those who enjoy mechanical excellence, technical uniqueness, and extraordinary craftsmanship.

A critical look at *all* the facts and specifications will prove that the new SAAB 95 is one of the world's best engineered wagons.

*Engine, transmission and differential have a written warranty for 2 years or 24,000 miles.

1ST OVERALL WINNER—MONTE CARLO RALLY, 1962-1963



\$2345 P.O.E.

(little enough for one of the world's best engineered station wagons)

Arrange a test drive at your nearest SAAB dealer. Or write for more information—and the SAAB North American Road Atlas, a 64-page comprehensive travel guide valued at \$1.00, but yours for only 25¢ to cover postage and handling. SAAB Motors, Inc., Dept. 605, 405 Park Avenue, New York, New York.



SAAB MOTORS, INC. — NEW YORK • NEW HAVEN • JACKSONVILLE • ST. LOUIS

Jim Roe Tests the Lone Star Cruise Liner II

[Continued from page 104]

sea." This was no fluke, I'm sure. My years of rigging and testing boats have convinced me that Johnson motors are always ready to go the moment you take them out of the shipping case.

Power to spare. Their fast pickup power scooted the Cruise Liner II out into Mobile Bay in a big hurry. Top speed for this boat-motor combination is more than 35 m.p.h. I've operated four-cylinder 75-hp. Johnsons like these for several years, so I was not at all surprised to feel the thrust when I pushed the throttles toward the wall. Earl Glenn, of the Lone Star Company, was caught a time or two in the cockpit—when I failed to warn him—and testified that the pickup literally took him off his feet.

With this kind of power, you can get a whole flock of skiers up all at once. Or head for the barn in a hurry if unfriendly clouds loom over the horizon—as they were doing most of the time we were out. We kept a constant check on the approaching weather with a Zenith 790 Royal Navigator radio. We tuned it alternately from the New Orleans to the Pensacola FAA aviation weather advisories on the long-wave band, and used plug-in earphones so we could hear the weather even when operating the engines at speed.

Easy control. But the weather got no worse, so we were able to put both boat and motor through all the paces we had planned. I was particularly pleased with the ease of handling and the responsiveness of the new Electramatic single-lever controls. They are so well tuned we even approached a dock at one point using the engines as our only steering device. By varying their speed and by operating one motor in forward and the other in reverse, we were able to maneuver very well and make a near-perfect approach to the dock.

The single levers operate electrically, sending impulses to clutch springs in the lower-unit gear case (there are two springs there—one for forward and one for reverse). When the lever is in neutral, the clutches rotate freely around the hub. When the lever is moved into gear, an electric coil magnetically causes the spring to grip the clutch hub. Power for this is supplied by the 20-amp alternator-generators on the motors. These kick out full amperage at half throttle, and put out several amps even while idling or trolling.

A few faults. I have never yet operated a boat that I would say was absolutely perfect in *every* respect. The Cruise Liner II, though an outstanding boat, is no exception. Happily, most of the changes I'd like could be made rather easily. Sharp corners, for instance. There are several inside the cabin, particularly around the bow hatch. They are no big problem in calm water and with slow movements, but can become quite different in rough conditions. I'd recommend padding them. I'd also apply some nonskid paint on the bow deck.

A point the thoughtful boatman will do well to keep in mind: This is an able boat, superbly outfitted, and quite safe for its intended usage. But no 24-foot outboard is intended for big-sea conditions. And the aluminum that makes her light and easy to launch and recover also makes her more responsive to a sea.

Boat manufacturers are now building so many fine conveniences into medium-size and small boats you have to be careful they don't make you think you're skipping an ocean-going 40-footer.

Rain or shine. Our Mobile Bay run gave us a chance to see what the Cruise Liner II was like in heavy rain. Lots of boats are strictly fair-weather craft. Even a small rain aboard one of them will drive you back home. But this is a boat that lets you have fun aboard even in a downpour.

The cabin is light, large, well equipped. There's room to relax in snug comfort, regardless of rain or shine. And the aft curtains are so designed that they give full headroom in the entire rear cockpit. You can be aboard on a rainy day and have the use of the cabin and the whole cockpit area. True, you may not wish to cruise many miles from the dock under such conditions, but this handy combination of well-designed features can give you many extra boating days every season.

In action, the Cruise Liner II proved every bit as handy as she'd looked on the boat-show floor: A well-designed, roomy, ready-to-go family boat. Big enough for all the kids and their friends. Fast enough to delight the heart of a teen-age son. Full of convenience and safety features to win the stamp of approval of the lady of the house. Big and brawny enough for Father. And economical enough in both first cost and upkeep to stay inside the budget. ■ ■

SHOOT A STAPLE WHEREVER YOU'D DRIVE A NAIL!

ARROW

T-50 All-Purpose STAPLE GUN

Same Machine
uses 6
Staple
Sizes . . .

"ONE
SQUEEZE
AND YOU'VE
NAILED IT!"

Available at Hardware, Building, Lumber and Stationery Dealers Everywhere.
ARROW FASTENER CO., INC. 1 Junius St., Brooklyn, N. Y.

This is nothing new, BUT...

... we think you want a profitable, enjoyable hobby; a rewarding sideline; or an interesting business that is all YOURS. Manufacture and sell ornamental concrete items. It's both enjoyable and profitable. Get the full details right away. We manufacture and sell on a direct basis the industry's best molds. Durable, Dependable, High Quality and of Aluminum. 96-pgs. "How To Turn Concrete Into Gold" includes 29 pgs. of priceless instructions for professional results. Describes and Prices over 300 molds for Bird Baths, Benches and Tables, Flower Urns, Statues, Animals, Religious Items, and many more from 2" to 68" high. It gives the full story. Order yours TODAY—Rushed to you by First Class Mail. It's only \$2.00.



No. 447 Grecian Jr. Mold makes concrete item 9 3/4" high. Price of Mold only \$30.00 AND, there are over 300 others to select from.

HOW TO
TURN
CONCRETE
INTO
GOLD

SEND
\$2

Manufacture And Sell Your Own
Ornamental Concrete Items
OVER 300 DIFFERENT DESIGNS

Concrete Machinery Co., Inc.
839 Lenoir Road, N. W. • Hickory 7, N. C.

HOW TO PROTECT YOUR INCOME! Earn Extra Money With A Rapid

SHEAR SHARPENER AND KNIFE SERRATOR



Easy to operate—professional-type sharpener does a perfect job in just 2 minutes on all types scissors and shears, including pinkie shears. Knife guide puts proper edge on any blade. Knife serrating attachment puts saw-tooth edge on hard or soft steel blades. Quick profits from homes, dressmakers, barbers, restaurants, hotels, butchers, etc. No experience needed. Big opportunities with this precision ball bearing machine. Has 1/4 h.p. motor. A money-making investment—write for FREE FOLDER PS-16.

BEAVER MFG. CO. P.O. Box 434, 800 So. Isis Ave., Inglewood, Calif.



LOW COST WELDER WELD - BRAZE - SOLDER - CUT

NO OTHER WELDER AT THIS PRICE INCLUDES THIS COMPLETE EQUIPMENT—FULL FACE SHIELD, HEAVY CABINET, GROUND CLAMP, HEAVY WELDING CABLES PLUS twin carbon arc torch, welding rod holder, carbons, welding and brazing rods, flux, solder, instruction book. Make and repair auto bodies, parts, fenders, trailers, boats, metal furniture, fixtures, ornamental iron, farm equipment, garden tools, bicycles, toys, etc. Operates on any properly wired 115 V. line. **TEN-DAY FREE TRIAL. FULL ONE-YEAR GUARANTEE.** More than 250,000 in use in homes, garages, farms, shops, factories. Now ANYONE can weld, braze, solder, cut, heat metal without experience. Does 1001 jobs on all metals. Save and earn money.

SEND ONLY \$2.00

Pay postman \$12.95 plus C.O.D. charges. Practical lifetime gift for hobbyist, mechanic, auto restyler, hot rodder, homeowner. Order today on 10 DAY MONEY-BACK GUARANTEE.

FOUR WAY WELDER CO. 1810 S. FEDERAL ST.
DEPT. W3-E CHICAGO 16, ILL.

GUARANTEED TO RELIEVE GRIPPING HEADACHES!



When you pick up one of the P & C Tools shown below, you've got your hand on the best answer to a gripping problem. Each P & C Tool is designed and built to do a specific job. And it's guaranteed to do it!

P & C PLIERS

All kinds of powerful pliers for hundreds of gripping and cutting jobs.



P & C OPEN END, BOX AND COMBINATION WRENCHES

For a snug, non-slip grip. Many sizes.



P & C CLIK-STOP AD- JUSTABLE WRENCHES

Longer jaws, square opening give better fit on any shape of nut or bolt. The most advanced adjustable wrench made!



P & C SOCKETS, ATTACHMENTS



Sockets that fit easily onto nuts and bolts are real time savers. Wide selection of handles, ratchet wrenches.



P & C PIPE WRENCHES

For brute strength and heavy loads!

In more than 14,000 stores . . .
the **BEST TOOLS** money can buy!



P & C TOOL COMPANY

Portland 22, Oregon

Subsidiary of Pendleton Tool Industries, Inc.

DNA: It Calls the Signals for Life

[Continued from page 68]

small molecules out of big ones. In the case of DNA, the pieces—six kinds of sub-molecular units—had been identified. Now it was necessary to figure out how the jigsaw puzzle fitted together.

Another way is to use X rays, but in a special manner. A technique called X-ray diffraction lets physicists take a peculiar kind of look inside certain kinds of molecules—those that form crystals.

DNA extracted from cells and purified is a jelly-like material. Not much resemblance to a crystal, you might think. But when it's pulled like taffy and dried under the right tension, it forms fibers that do have a complicated crystalline structure.

One of the Nobel Prize winners, Dr. Wilkins, is a physicist who worked in this country on the Manhattan Project. After World War II, back in England, he got interested in biological problems and became a biophysicist. During the early 1950s he perfected a method of making X-ray diffraction photos of DNA fibers.

Such photos are taken by shooting a very narrow beam of X rays through the sample. Some of the X rays are bent by interaction with atoms. The emerging X-ray waves interfere with each other to form a pattern that registers on the film.

X-ray diffraction photos do not show the outlines of the molecules they represent. They are in "reciprocal space"—small distances on a photograph stand for large spaces in the molecule, and vice versa. The pictures must be interpreted by mathematical analysis; and the more complex the molecule, the more difficult that is.

Drs. Crick and Watson began to work on methods of interpreting the X-ray diffraction photos of DNA. They met at Cambridge, where Watson had gone to do research a couple of years after getting a Ph. D. from Indiana University.

Working backwards. Crick had worked out a theory for predicting what X-ray pictures of various molecular models would look like. That is, the pictures were so hard to interpret they had to work backwards: devise a model, then determine mathematically what its X-ray diffraction equivalent should be. Then the prediction was compared with actual distances and angles on the X-ray photos.

The two experimenters shared with Wilkins the idea that a twisted, helical molec-

ular structure might fit the X-ray data (it had been discovered that such twists exist in other molecules produced by the cell). They built a model of rods, clamps, and sheet-metal cutouts (representing the various known pieces of the jigsaw puzzle), and evaluated it mathematically.

This first model didn't prove out, and they temporarily dropped the problem, going on to other research. Some months later, in February, 1953, they learned of a structure proposed for DNA by Linus Pauling, Caltech's Nobel-Prize-winning chemist. From their previous work, they knew that Pauling had to be wrong. This stimulated them to try another model, incorporating new information about the exact shapes of some of the subunits of DNA.

A month later they had a model that fitted the X-ray data closely. From it, they worked out the profound "Watson-Crick hypothesis," which explains how the DNA molecule does its work in the cell. That hypothesis has been tested through ingenious experiments in numerous laboratories, and is accepted as gospel in the new world of molecular biology.

The key to life. The DNA molecule stands revealed as a double helix shaped roughly like a twisted ladder.

The two legs of the ladder are identical, but the rungs are not, and this is the key to the molecule's ability to store information. The order of the four different subunits that make up the rungs is the code of life.

The way the subunits link across the rungs is the key to DNA's ability to transmit information. Each rung actually consists of two units, but the pairing of the units follows definite rules; the molecule can "unzip," and each half serves as a template for rebuilding the missing half, producing two new molecules identical to the original one.

The Watson-Crick hypothesis has made possible a new view of the "molecular basis of life": In the cell—really a miniature chemical factory—DNA molecules contain the instructions that tell the molecular machinery of the factory what new molecules to build. The product molecules in turn determine the function of the cell—whether it's a blood cell, a nerve cell, a sperm cell, or (if not part of a many-celled organism) perhaps a harmful bacterium.

DNA: It Calls the Signals for Life

In this way, the information stored in DNA molecules specifies an entire community of cells, such as those that add up to a human being—the color of his hair and eyes, his basic aptitudes, his built-in sensitivity or resistance to disease.

Programing a man. An individual DNA molecule is about 10,000 subunits long (that is, there are that many rungs on the ladder), and the list of instructions necessary to specify a human being is about 10 billion DNA units long. If the DNA molecules containing that message were placed end to end, they would make a strand 10 feet long, but only one twelve-millionth of an inch thick. Actually the strands are bundled in the microscopic bodies called chromosomes, in the nucleus of each cell, which hold the machinery of heredity.

The specifications must be passed on from generation to generation. This takes place during the cell division, when the chromosomes divide. Preparatory to cell division, the DNA molecules in the chromosomes have unzipped and have been copied by the machinery of the cell.

Work in the cell, controlled by DNA, is important not only to healthy life, but also to disease. Viruses, for example, take over cells and turn them into virus factories by interfering with the normal flow of instructions and substituting new instructions. Hereditary diseases are the result of "errors" that have crept into the coded instructions during copying of DNA molecules. Such changes also transform normal cells into cancer cells, which have "forgotten" their usual roles and "learned" new functions.

Those facts explain why DNA has created such excitement among biologists. If a way can be found to send man-made chemical messages into cells and alter the instructions stored there by DNA molecules, almost anything is possible.

But that isn't likely to come about this year or next. First the code must be deciphered. That's where most of the research on DNA is concentrated today.

Another unsolved problem, perhaps even more mysterious, is how cells "decide" to use particular instructions stored in their DNA archives. Discoveries on this frontier will explain how cells respond to outside stimuli—and how a single fertilized cell can multiply selectively to produce the many different kinds of specialized cells that make up a human being. ■ ■



the difference is PLA

Look at the models that win competitions and you'll see the difference PLA enamels make. One coat covers. But new, instant-drying SPRAY PLA enamel lets you apply 10 coats in ten minutes. And with each coat, you add dramatic depth and beauty. Brush on PLA for the little finishing touches. Hundreds of color combinations possible with transparent SPRAY PLA colors over metallic base coats. PLA for trim, in 54 colors—15¢ each. SPRAY PLA in 25 matching colors—69¢ each.

Made for models—now people are using it on everything • Model buildings • Miniature statues • Plastic • Wood • Metal • Styrofoam • China • Glass • Ceramics • Jewelry • Rubber • Paper • Leather



TESTOR'S

pla
INSTANT-DRYING
ENAMELS

THE TESTOR CORPORATION Rockford, Illinois

THE POCKET SIZE MACHINE SHOP Dremel MOTO-TOOL

Handiest tool you'll ever own. Moto-Tool's high speed (27,000 rpm) is ideal for precision grinding, drilling, polishing, carving, engraving, deburring, sharpening. Does fine detail work with pin-point accuracy. Eliminates time consuming hand work, gives the finished job a professional look. Weighs only 13 oz. — handles easily as a pencil. Fastest, most powerful tool of its kind. Widely used by tool and die makers, model builders, gunsmiths, repair men, schools



No. 2 Moto-Tool only.....\$19.95
No. 2 Moto-Tool Kit..... 29.95
(Incl. No. 2 Moto-Tool & 23 assorted accessories in steel case)

NEW HEAVY DUTY NO. 3 MOTO-TOOL

New high torque motor designed for industrial use. Same features as No. 2 plus 50% increase in power. Weighs only 18 oz. Complete with $\frac{1}{8}$ " and $\frac{3}{32}$ " collets and finger grip in steel case...\$29.95

SEE YOUR DEALER OR WRITE FOR CATALOG
DREMEL MFG. CO. DEPT. 123-E, RACINE, WIS.
QUALITY POWER TOOLS SINCE 1934

Speedy Sprayer



Tool of a dozen uses!

Motorized! Ready to plug in and spray! Use it to paint anything, from a toy to a house. Does an hour's painting in just minutes. Pays for itself on the first big job. Also use it to spray insecticides, weed killers, liquid fertilizer; vacuum, tire inflator, etc. A real professional tool needed in every work-shop. Ask for Speedy Sprayer "Compact" No. 404. **\$39.95**

Slightly higher Denver West.

Write for "How to Spray" booklet and catalog.

W. R. BROWN CORP.

Specialists in Portable Sprayers Since 1921

2637 N. NORMANDY AVE., CHICAGO 35, ILL.

Popular Science Tests the Hot Compacts

[Continued from page 57]

At higher speeds, approaching the breakaway point, the car becomes an over-steerer—the tail wants to lose traction and slide. The heavy-duty suspension moves the breakaway point up to where it won't be encountered under normal driving conditions. When the rear wheels do break away, the car is easier to straighten out than with the standard suspension.

Surprisingly, the ride is not affected greatly by the stiffer springing. It remains comfortable over all types of road surfaces.

As on most rear-engine cars, the steering is easy. But it could be faster. The four-speed transmission has a light, positive throw. The synchronizers, however, can be beaten during a fast shift.

Parking is a snap. The steering, visibility, short overall length, and lack of excessive body overhang all contribute to maneuverability.

This car cannot be called quiet, but the noise level never becomes unpleasant. There's a sporty purr during acceleration that disappears while cruising. Engine performance is better than adequate. The little six develops good torque at low speed. Approaching passing speeds, the blower suddenly comes on with an unexpected belt. The faster you go, the more power there seems to be. Only when you're close to the century mark does the engine start to poop out.

Falcon Sprint

The Sprint is the spanking-new version of the Falcon that won in its class—based on engine displacement—in Europe's Monte Carlo rally last January. But one significant difference exists between the Monte Carlo Sprint and the Detroit production job: The cars that competed in Europe had four-barrel carburetors; the standard Sprint has only two barrels. Two barrels improve the gas economy, of course, but downgrade the performance. Ford is chary about committing itself to any prospect for four barrels over here.

For the pounds of car that each horsepower had to pull, the Sprint's performance was respectable. It will not move car buffs to ecstasies. The suspension has been hardened a bit to accommodate the added weight of the V-8 engine, and this could be felt in crossing tar strips in concrete pavement and other road irregularities.

Popular Science Tests the Hot Compacts

The rear wheels broke away in a turn only if forced, and the relative lightness of the stern was more obvious in the steering than in cornering. The car did not pitch. At high speeds it was astonishingly stable. The brakes were more than adequate.

For maximum acceleration, the gears on this car should be shifted at 4,600 r.p.m., but the over-run on the busy little engine causes the driver unacquainted with the car to accumulate some 400 revs more before he can manage to change gears. The car had not emerged from second gear when it hit 60 from a standing start.

The transmission (a Borg-Warner, with a design-assist from Ford) is one of the best. It is positive, the throws are reasonably short, the ratios are well-spaced, and it provides no back-talk.

The Sprint's great fault is in its weight distribution. It steers like a truck. While the heavy front end gave it the stability of a locomotive, it made parking a chore. Even under way, at low speeds the steering required a disturbing amount of effort in the turns. This poses the standard dilemma for the design engineers—should they add the weight of power steering to take care of a front end that is already overweight?

As good as it is, the overall performance of the Sprint could have been better—the car had less than 600 miles on the odometer. Engine and drive train were still stiff.

Olds Jetfire

The Jetfire's suspension is medium—firmer than that built into the rest of Oldsmobile's lines. Body lean on turns is moderate but does not seriously impair the roadholding. Cornering hides no unexpected tricks.

This car understeers throughout. It's still understeering when the limit of adhesion has been reached. The front end breaks away gently. The rear won't slide out unless you want it to very badly.

The steering on the test car did not feel as slow as the figures in the table indicate, but it still could stand some speeding-up without increasing the manual effort too much for comfort. The parking was easy, the visibility good.

The Borg-Warner gearbox was a beauty. Close ratios allowed fast, easy shifts with a minimum loss of r.p.m. The synchronizers were hard to beat. The well-placed

CONTINUED

palley's SPECIAL SURPLUS

BOLO-MACHETE
Has 11 1/4" tempered steel blade, hardwood handle and genuine leather belt sheath. Excellent for hunter, camper, etc. May also be used for clearing brush, meat cleaver or chopping. 20" O/A lgh. **2.99**

KNIFE-BAYONET U.S. ARMY
Ideal skin divers knife, hunting knife or for the collector. Made by Camillus of the finest steel. Has 6-1/2" blade, double-edged for three inches from the point. Handle is laminated leather. Overall lgh. 11-5/8" **2.98**

PARATROOP FOLDING MACHETE
Has an 11" blade of finest blued nickel alloy steel with precision ground edge. Unusual bargain for camper, back packer, hunter, etc. Blade folds into handle and steel guard like a huge pocket knife. Hand fitting handle has knurled grip. Open lgh. overall 17" **3.99**

Leather MACHETE HOLSTER - Extra hvy. duty. Specially designed for above machete. Fits on belt ... **1.50**

3 SIZES

SHOP-KING ROTARY RASP SET
SHAPE • CUT • FORM • MILL
Fits any Electric Drill! Drill Press! Motor! Cuts woods, plaster, brass, plastics, copper, aluminum, plywood, wall board, rubber, etc. Ideal for leveling, shaping, sanding, removing paint, etc. Never clogs or needs sharpening. Made of hardened, tempered steel - outlasts hundreds of sandpaper drums. Sizes: 1 1/4", 1-7/8" & 3/4" dia. 1/4" SHANK. Price includes all 3 sizes in box **4.88**

"TINY TIGER"-300 WATT POWER PLANT
INSTANT ELECTRICITY ANYWHERE - CHARGE BATTERIES / LIGHT YOUR LIGHTS / PUMP YOUR BILGE / COOK YOUR GOOSE! Here's 12 lbs. of gas motor driven power, small enough to fit on the hand. Delivers 115 volts AC or 12 volts DC, 300 Watts. Enough power to light a 3 room house or cabin, any tent, operate power tools or ham radio, etc. Has 3/4 HP, 6300 RPM gas motor with direct drive generator. Length 11", width 7-1/2", height 8-1/2". Uses standard outboard fuel. ... **99.50 COMPLETE**

PORTABLE 1/2 H.P. AIR COMPRESSOR
for SKIN DIVER - GARAGE - ARTIST - etc.
A remarkable surplus conversion - has a surplus Cornelius Compressor combined with a NEW 1/2 HP, 115/230 V., 60 cycle AC motor plus a mounting frame with built-in carrying handle. Pressure tested to 3000 PSI. Ideal for filling diving tanks, inflating struts, accumulators or to use any high pressure air use. Fills tanks to 2250 PSI. **99.50**

Unconverted Cornelius COMPRESSORS - Air Force surplus with 1/3 HP, 27 V., DC motor. Delivers 1500 PSI. Used but excellent. **34.95**

3000 PSI PROFESSIONAL AIR COMPRESSOR
A Big Brother to the above compressors ... 3 stage Cornelius Compressor that develops 2.0 cubic ft. displacement per min. at 3000 PSI pressure. Fills the average diving tank in approx. 20 minutes. Available in Electric or Hydraulic models. ... Overall height 14" - Width 11". **UNUSED!**
Electric Compressor - 24 V. DC, 3000 PSI.
Hydraulic Compressor - Working pressure 2100 PSI, 3000 PSI output. **Only 199.50**

HYDRAULIC MOTOR DRIVEN GEAR PUMP - 4.5 GPM
Delivers 4.5 GPM at 2300 RPM at 1000 PSI. Motor 24 V. DC, 250 A. at 2300 RPM. **17.95**

260 PAGES OF SPECTACULAR BARGAINS! Government Surplus, Factory Closeouts and hard-to-find items of all kinds. You'll find special bargains in U.S. Army, Navy, Airforce and Industrial surplus - PLUS the World's largest on-the-shelf stocks of New and Used Hydraulic Cylinders, Pumps, Motors, Valves, etc. **ORDER NOW!**
Only 50c TO COVER HANDLING & MAILING. Your 50c will be refunded with your first order of \$1.00 or more.

TO ORDER: Send check or M.O. 1/2 dep. with C.O.D.s. P.O.s accepted from D&B firms rated F25 or better. All items sent freight or postage collect.

palley's 2263 E. VERNON AVE., Dept. PS-53
LOS ANGELES 58, CALIFORNIA

Popular Science Tests the Hot Compacts

stick had short, easy, and precise throws.

The engine was quiet except under hard acceleration. Then it developed a purr that was pure Mendelssohn. Our 0-60 runs were started by revving the engine to about 2,000 r.p.m. and easing out the clutch, keeping the wheels just on the verge of spinning. With the torque that the Jetfire develops, wheel spin is an ever-present problem. Upshifts were made at about 5,300 r.p.m.

The brakes were only adequate (reflecting the minimal swept area for the curb weight). Stops were straight and even, but the car should have snubbed down faster.

Two bleats are in order: The horizontal speedometer was hard to read, and the Mickey Mouse power gauge would have been far more useful if it had carried vacuum-gauge graduations.

One point should be stressed about the turbocharger—its boost is not confined to higher speeds, as in the Corvair. It provides a healthy boost at all speeds. In fact, a Jetfire topped its class at the 1963 Pure Oil tests, doing 0-60 in 8.8 seconds.

Pontiac Tempest

POPULAR SCIENCE's Le Mans model offered brute acceleration. In pure scat, this V-8-powered car is the fastest of the five compacts, as its pounds-per-horsepower would indicate. At 70, there's still enough reserve power to push you back hard in your seat.

Except for its lower axle ratio, the test car was essentially the same as the one that ran away from seven Corvettes (including six '63 StingRays) and a brace of Ferraris in the 250-mile American Challenge Cup race at Daytona last February.

The brakes felt adequate, but it is only fair to say that the Tempest's big brothers at Pontiac have better ones. A redesigned suspension is much improved over '62. Because of the independently hinged rear wheels, the ride proved to be unusually comfortable. This does contribute, however, to a marked oversteer. The terrific torque adds to it. Too much or too little gas on a fast turn could make her spin.

Even so, the point of breakaway is higher and less sudden than last year. This, no doubt, is helped by the considerably stiffer spring rates all around that were made necessary by the hefty engine.

The test car's transmission was not synchronized in first gear. The synchronizing rings could be beaten, and the throws were quite long. The steering was easy, reflecting the number of turns lock-to-lock, but for an impatient driver, too slow.

The instrumentation was good—what there was of it—and the round speedometer easy to read. The tachometer would have been more fun if it had been moved to the left where it could be seen better.

Super Lark

Stabilizing bars gave the Lark the decorum of a church deacon in hard turns. The rear end broke away only under considerable pressure. The car was highly stable at 100 miles an hour, with practically no tendency to pitch. The suspension was firm but the ride, nonetheless, smooth.

The brakes (disks in front) snugged the car down promptly and as straight as an arrow from 80 miles an hour with hands off the wheel. The gearbox (again from Borg-Warner) had the customary B-W smoothness and agility. The synchronizing ring in second gear on this particular car could have stood some attention—it tended to balk on downshifting from third. Parking, with the overall shortness of the vehicle, was a pleasure.

With an engine peaking at 5,000 r.p.m., an acceleration of 0-60 never reached third gear. Upshifting to third at 60 m.p.h. was like a kick in the pants. Traction bars, shrewdly added to the rear axle to accommodate the torque of the blown engine, effectively prevented axle windup and any hesitancy when the accelerator went down from a standing start.

The instrumentation properly included a vacuum gauge for the power output, even though it was only a temporary installation. The remainder of the panel, we suspect, will undergo a styling renovation for '64. For a car of this performance—take a glance at the top speed in the chart—the customer will demand more glamour.

For a front end weighted with a V-8 and supercharger, the steering was surprisingly easy—due, no doubt, to a steering ratio that is high for a compact. The only really vexing design component was the pedals. Offset to the left, they took getting used to. It required rapt attention to hit the clutch with the left foot and the brake with the right. ■ ■

Have Gun—Will Solder
[Continued from page 165]

The answers to the questions were in the textbooks. The resistance of copper is quite low, but it does have some. And it increases with temperature. If a circuit is entirely copper wire of uniform size, the whole length of the wire will get uniformly hot. But if part of the circuit is much smaller in cross section, that part will have more resistance and will start to heat faster. As it heats, the resistance goes up still more and it heats still faster. The heat, then, tends to concentrate at that point. These facts gave Weller his clue.

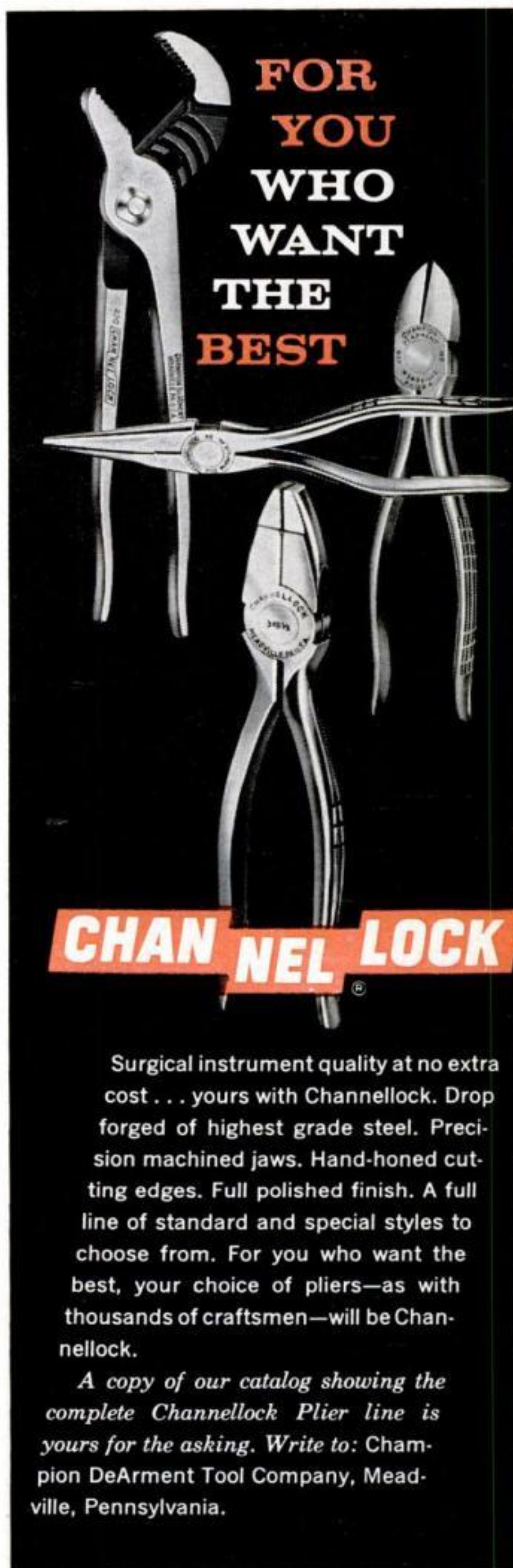
Limiting the current flow was simply a matter of applying Ohm's Law: If you are committed to a circuit of very low resistance, then you have to use a very low voltage. A step-down transformer, lowering ordinary 110-volt power to a much lower value than had been considered before, was the answer.

Weller designed a pistol-shaped soldering gun using these ideas and got his patent on it in 1941. He tried to peddle it to the major manufacturers, but they all rejected it as impractical. In desperation, he built 274 guns by hand in his basement workshop and sold them to individual radio service shops. The men on the job were so enthusiastic about the new instant-heat soldering tool that he started to manufacture them on a modest scale in 1946—the beginning of the Weller Electric Corp.

The man behind the gun had only a public-school education. Energetic, untalkative, single-minded when he's grappling with a problem, Weller prefers to run his business from behind a lathe rather than an executive's desk. He thinks with his hands as well as with his brain. One of his pet ideas is that anything you want to know, you can find in a book somewhere. He has proved it repeatedly by making himself an expert on such widely diverse subjects as tax law, production-machinery design, and reciprocating magnetic motors.

Today, the Weller Electric Corp. of Easton, Pa., has two factories in Puerto Rico, too. Weller has invented and makes a number of other tools—a power sander, a saber saw, and the Magnastat soldering iron with built-in temperature control for production-line work.

And it all started because a radio repairman got impatient waiting for his soldering iron to get hot. ■ ■



**FOR
YOU
WHO
WANT
THE
BEST**

CHAN NEL LOCK®

Surgical instrument quality at no extra cost . . . yours with Channellock. Drop forged of highest grade steel. Precision machined jaws. Hand-honed cutting edges. Full polished finish. A full line of standard and special styles to choose from. For you who want the best, your choice of pliers—as with thousands of craftsmen—will be Channellock.

A copy of our catalog showing the complete Channellock Plier line is yours for the asking. Write to: Champion DeArment Tool Company, Meadville, Pennsylvania.



Father's Day • Graduation • Birthday 3/8" DRIVE ALLOY STARTER SET

Lots of space for keeping other tools in the heavy duty hip roof box. Removable tote tray with exclusive tool organizer. Tools are American made genuine alloy steel, for a lifetime of use. Complete

\$19.95

Fleet TOOLS

Special certificate included for
FREE
SPARK PLUG
SOCKET WRENCH
Retail value **\$1.85**

at volume outlets

offer expires July 31, 1963

SCHILLER PARK, ILLINOIS

No washing
No sandpapering

Finer results in painting

No need to scrub and sandpaper enameled or varnished woodwork before repainting! WIL-BOND, applied with a rag, removes dirt and grease while it DULLS THE GLOSS. New finish goes on smoothly—no streaks—bonds tightly. Helps prevent chipping. At paint and hardware stores.

Write for free Wil-Bond folder.

● Send 25¢ for illustrated Refinishing Manual
Wilson-Imperial Co., 121 Chestnut St., Newark 5, N.J.



Works
in
Seconds!



Loosens Rusted Bolts
nuts, screws, "frozen" parts!

LIQUID
WRENCH
SUPER-PENETRANT

BONUS USE: Add to crankcase to quiet noisy valve lifters... remove gum, sludge deposits!

THEN ADD ...

MOTOR-MEDIC
EXTRA LUBRICATION ...
SMOOTHER PERFORMANCE



Both at leading dealers everywhere!

Tent Trailers—Buy or Rent One

[Continued from page 120]



One of a pair by Heilite, the tent folds like an accordion. One model rides single wheel.

the usual camping-trip clutter. The trailers are accepted at most public camp grounds.

The old-timers in the field offer both off-the-ground and on-the-ground types, with a full line of extras (spare tire and wheel, canopies, enclosed porches). Sears boasts that Sir Edmund Hillary tested their trailer in a 10,000-mile cross-U.S. trip. Montgomery Ward has by far the largest enclosure (7' by 22'—by permanently attaching the sun porch). A couple of makers also offer pop-up tent units for use on a pick-up truck.

Manufacturers of tent trailers include Vesely Mfg. Co. (Apache), Box 151, Lapeer, Mich.; Ward Mfg., Inc., (Nimrod), 2530 Spring Grove Ave., Cincinnati 14; Heilite Trailers, Inc., Lodi, Calif.; Right Products, 213 Dunn St., Cincinnati 15; Craig Mfg. Co. (Trade Winds), Manawa, Wis.; Bethany Fellowship, 6820 Auto Club Rd., Minneapolis 20; Trimline (Gator), 11820 W. Ripley Ave., Milwaukee; Norjack, 600 S. 108 St., Milwaukee.



Shape is a teepee, and that's its name. Bethany Fellowship, Inc., Minneapolis, makes it.

Now—Inventing Is Easier Than Ever!

[Continued from page 74]

crude. Why not cement them on? The system he devised is beautifully simple. The wiring units are coated with a cement that stays sticky when covered with a plastic. To install them, you just peel off the plastic covering and push the unit into place. There it stays, fastened for good. Patentable? It was, as patent No. 3,029,303 attests.

Plastics are a happy medium for many independent inventors. Joseph Kitson of Connecticut was impressed with the marvels of polystyrene bubble-type plastic and with it invented a new form of building material. His patented discovery consists of a method of filling the bubbles with a fluid grout after panels of the plastic are in place in the building. He's hit on a scheme that gives structural strength to a light, easily handled material.

Sleeper. A Minnesota physician, Robert Horton, has the gratitude of many parents now getting a good night's sleep. With the help of plastics, miniature batteries, and transistors, he invented a device that puts squalling babies to sleep in a couple of minutes.

Noticing that babies are soothed by a humming noise, Dr. Horton tracked down the sound they like best—B flat. A few years ago he'd have been stumped by just how to make a gadget small enough and safe enough to utilize this discovery. It was no problem today. A buzzer that gives the right vibration, a tiny battery, a transistor to cut power demands and give it a 2,500-hour life, and a neat, smooth, plastic housing suitable for placing in a baby's crib were the ingredients that gave the doctor his now widely sold Slumbertone.

The miniature battery that powers Horton's baby-comforting buzzer is one of the hottest ready-made invention components ever to emerge from the big labs. Independent inventors have used them to power everything from pencil sharpeners to swizzle sticks. At least 100 battery-powered toys—games, tanks, planes, submarines, boats, and animals—are the brain children of free lancers.

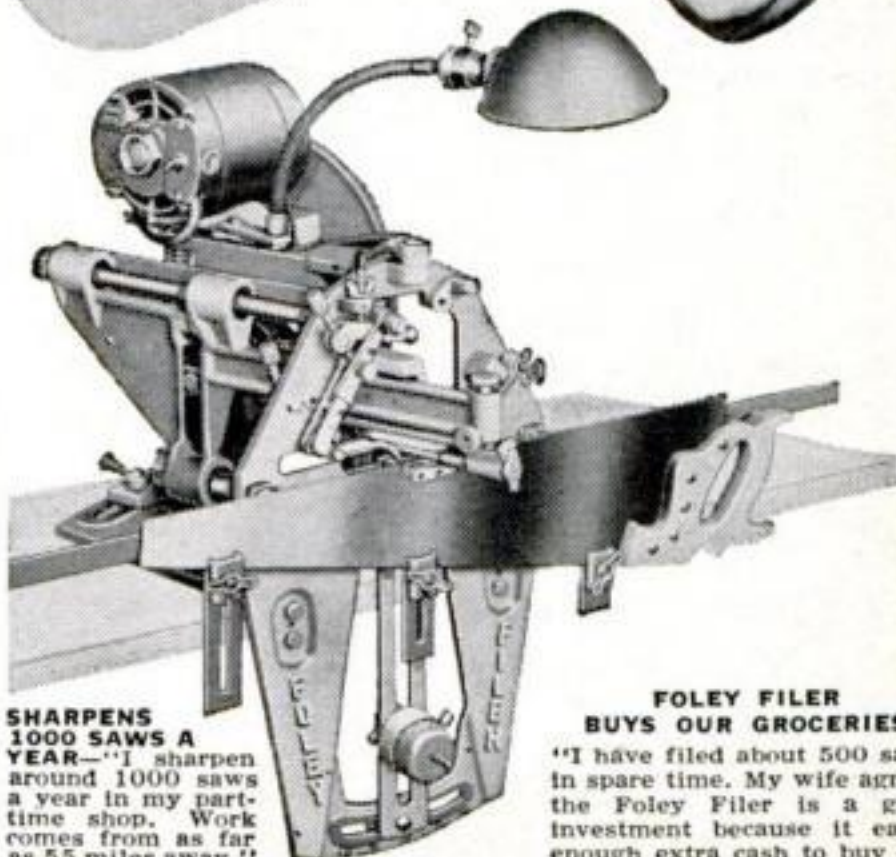
Combining the parts. An invention that's typical of the way inventors profitably team up peanut batteries and small electric motors is that of Ingle McAda of Wichita Falls, Tex. He took an ordinary duck decoy, installed a propeller shaft, a small electric motor, and a battery. His tethered

CONTINUED

FREE PLAN

Tells How To Start
Your Own Business

FILING SAWS



**SHARPENS
1000 SAWS A
YEAR**—"I sharpen
around 1000 saws
a year in my part-
time shop. Work
comes from as far
as 55 miles away."
—Joe H. Walker.

FOLEY FILER BUYS OUR GROCERIES

"I have filed about 500 saws
in spare time. My wife agrees
the Foley Filer is a good
investment because it earns
enough extra cash to buy our
groceries." — R. J. Kreuser.

FOLEY FILED SAWS BRING NEW CUSTOMERS

Here is a steady repeat CASH business that pays from \$3 to \$6 an hour, and you can start in your own basement or garage in your spare time. Every saw you sharpen with the machine accuracy of the Foley Saw Filer is an ad that brings more customers. J. C. Deibert wrote us: "Since I got my Foley Filer five years ago, I have averaged 4 1/4 saws each day over all this time." Howard Kuhns says: "We operate 2 Foley Filers, and our business averages about 500 saws per month. The count last year was 5,798 saws."

The new model 200 Foley Saw Filer (shown above) is the first and only machine that automatically sharpens combination (rip and cross cut) circular saws—also all hand saws, band saws and crosscut circular saws. The adjustments are simple—there is no eyestrain—and you can start right away to turn out perfect cutting saws. Exclusive jointing action evens up irregular teeth — old saws cut like new!

"**MONEY MAKING FACTS**" explains how you can get business from hardware stores, home owners, farmers, carpenters, schools, mills, factories, etc. Just think, with a modest investment, no overhead, no stock of goods to carry, you can start right in on a cash business that will help pay the rent, buy groceries, or a new car. Time Payments available; send coupon today for this practical money making plan. No salesman will call.



Send for **FREE BOOK**

**FOLEY MFG. CO., 519-3 Foley Bldg.,
Minneapolis 18, Minn.**

Send me free book "MONEY MAKING FACTS" and
TIME PAYMENT PLAN.

Name

Address

Now—Inventing Is Easier Than Ever!

duck decoy could thus be moved realistically. His patent is broad enough to cover plastic decoys of his own design, but McAda got a running start by using existing ones.

While new developments offer virgin territory, a lot of successful inventors advise: Don't ignore older materials and devices. Plenty of opportunities await the alert amateur who is aware that big-business researchers can miss some pretty big bets.

Offhand, you'd hardly think there was any new way to exploit the small gasoline engine, yet Harry Leedom, a California engineer, found one. He evolved a unique wheel-power combination in which power from a small motor is delivered directly to a wheel by a belt running in a deep groove in the circumference of the rubber tire. Leedom's powered wheels in various sizes, along with the forks and brackets that adapt them to everything from scooters to cultivators, are now in production.

No patent problem. A question frequently asked by would-be inventors who would like to use ready-made parts is the one about patents. Isn't it harder to get a patent on a device that utilizes components previously patented? The answer is no. An amendment to the patent law, passed in 1952, says, "Whoever invents or discovers any new and useful process, machine, manufacture or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor." Furthermore, the definition of that word "process" is spelled out to include "a new use of a known process."

Another practical question is "Where do you obtain the makings for an invention?" You've dreamed up something that calls for a particular kind of plastic—how do you find a manufacturer of the stuff you need?

The answer's pretty simple. If you don't find it on the shelves of your local hardware store, and you don't see a suitable company listed in the telephone book, you turn to the inventor's friend, *Thomas' Register of American Manufacturers*.

If you live in a town of any size, your local public library is likely to have it. In its 9,030 pages you will find the names of everybody who makes anything. An index will lead you to the right page. You can then contact the manufacturer and get the names of dealers or suppliers, or such product information as you need.

Help from manufacturers. This can be a

wonderful lubricant to easing your invention along its way. Most companies, and all big ones, publish reams of technical literature, full of hints for inventors. For instance, Bakelite's "Technical Release No. 12" gave Charles Powell the information he needed about the company's polymerized vinyl resin to make possible his do-it-yourself sculpture.

The help may go beyond printed literature to discussions with company technical representatives, especially if your invention gives promise of providing a sizable market for the company product.

"A technical rep," says Harold Humes, who estimates he talked to a couple of dozen of them in developing his paper house, "can be a gold mine of information for the inventor."

Just how much company information can help an inventor is demonstrated by the experience of Michael Meyerberg, a New York theatrical producer who thought American women deserved decent light to put on their make-up. Even in the theater, Meyerberg hadn't seen a properly lighted make-up mirror. Fluorescent lights of low wattage around the mirrors didn't provide enough light or distribute it right. Incandescent lamps of sufficient wattage were too hot; low-wattage incandescents didn't give enough light.

Meyerberg got in touch with GE. Sure, company engineers told him, they had just the thing—a 15-watt lamp, with a special frosting inside, that gave a strong, diffused light but didn't get hot.

"I had my invention made the minute I found out about that lamp," he says.

He rigged up a compact, three-part mirror suitable for theater or home use, mounting five of the bulbs on each post and four above the center mirror. That was all there was to it—but it won him a patent.

More developments on the way. One thing is sure. The basement inventor isn't going to run out of opportunity. Thermo-electric plates, to deliver power without batteries or outside source; new plastics like Delrin, which is tough enough to secure automobile parts; pinhead-size microphones that can make all kinds of mechanisms respond to the spoken command—the list of new developments that are almost wholly unexploited is growing daily.

Among them will you find the makings for *your* million-dollar invention? ■ ■



Painting is Easy! ELECTRIC PAINT SPRAYER

Powerful built-in 110 V.
AC Motor

Just plug in
and Spray

Fully
Guaranteed



Pull trigger to spray paint, varnish, enamel, mothproofers, garden sprays, weed killers, insecticides, 3-7 times faster than a brush, easier to clean, too.

Completely self contained, Sapphire nozzle, instant heavy or light spray adjustment, 24 oz. graduated jar. Foolproof and trouble-free. Less than \$14.00 at dealers everywhere. Burgess Vibrocrafters Inc., Grayslake, Illinois

EVERLITE* World's THRIFTIEST Light Plants

(Item
869-
10T)



*Trade-Mark
Registered

NEW TRANSISTOR ALTERNATOR REPLACES GENERATOR

Now a Service Free Light Plant built with a transistorized alternator. Offers 30% greater efficiency—more power for less fuel. Terrific service life—no brushes to arc and burn. No more commutator to wear, no collector ring trouble. And best of all it costs no more to "go modern with Everlite." Thrifty 1000 watt, 115v. AC plant powered by a rugged easy starting 4 cycle engine—leader priced Model 869-10T. Wt. 65 lbs. as illustrated

179.50

f.o.b. factory

All sizes available—can finance. Write for catalog. Special models for public utilities—Approved for Civil Defense. Write

MASTER MECHANIC MFG. CO., Dept. B-563, Burlington, Wis.

Southern Customers write Dept. B-563, Box 65, Sarasota, Florida

1001 USES! WELDWOOD® FLEXIBLE WOOD-TRIM®



PROFESSIONAL LOOK TO PLYWOOD PROJECTS

Beautiful wood veneer, paper-backed, in handy rolls, 8' x 1", for edging plywood. Also, decorate lamp shades, book ends, do inlay work, etc. Apply with Contact Cement or Presto-Set® Glue. Oak, birch, African mahogany, walnut, fir, Korina®. At lumber, paint, and hardware dealer's. United States Plywood, Protection Products Div., Dept. PSM5-63, 2305 Superior Ave., Kalamazoo, Mich.

Model B-2
2 Ton

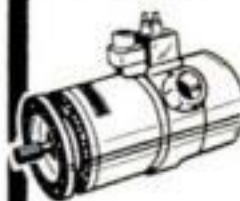


ALVA ALLEN Swaine Power Punch Presses 1 to 150 Ton Capacity

Complete line of Punch Presses in hundreds of different style and model combinations. Write for FREE literature on presses and complete line of punch Press accessories as—Feeds, Punch Units, Dies, etc.

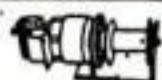
Alva Allen Industries, Dept PS, Clinton, Mo.

WAR SURPLUS AND OTHER BARGAINS SAVE UP TO 90%



DUAL-PURPOSE NAVY GENERATOR

Rated 200 AMP DC at 24 to 30 V. Also produces at 1200 watts of AC current. Excellent unit for making your own arc welder. We have sold 1000's. Now, due to special purchase, we are able to offer this gen. at lowest price ever—while present supply lasts. Tested prior to shipment—shpg. wt. 55 lbs. Approx. GOVT. COST \$350. SPECIAL \$16.95.



DELUXE ELECTRIC STORAGE BATTERY WINCH

A ruggedly built, heavy-duty winch with ball bearing construction throughout motor and gear train. 225:1 gear reduction. Rated cap. 3000 lbs. Contains heavy duty enclosed forward, neutral & reverse switch. Rugged 1 1/2" plate steel mounting base with outrigger support. Dim. 22" L. x 9" W. x 8" H. Handles 250' of 1/4" cable. Built for 12 V. battery operation; will also operate on 6 V. at reduced cap. & speed. A must for scouts, jeeps, trucks, boat loading trailers. Shpg. wt. 80 lbs. Approx. GOVT. COST \$490. New. Model E-D. \$75.00

*Lighter duty & remote control models also available from \$55.00. Write for spec sheet.

AIR COOLED WELDING KIT—Contains Famous P-2 generator (200 amps/30 V.D.C.) with built in fan. Also in kit—D.C. Voltmeter, Control Rheostat, Switch, 300 amp. Electrode holder, welder's gloves, adjustable welder's helmet, 30 ft. rubber covered welding cable and wiring diagram. All units pre-tested prior to shipment. A terrific value. All units guaranteed pre-tested. Shpg. wt. 75 lbs. Approx. GOVT. COST \$475. Most items new—all perfect. \$47.50.



DOUBLE-ACTION HYDRAULIC CYLINDERS

Can be air or oil operated. Ideal for shop, production machinery, hydraulic steering and 100's of other uses. Steel barrel aircraft quality, precision built. 7 3/4" stroke, 5/8" shaft, 1 1/4" bore, 15" overall length. Shpg. Wt. 7 lbs. per pair. Special AIRBORNE price—2 for \$7.



FLEXIBLE SPLINE COUPLING—Lovejoy type. Fits all aircraft gen. with 16 tooth, 7/8" spline shafts. Excellent for direct drive on aircraft gen. New. Highest quality in 1" or 3/4" standard shaft drive. Specify when ordering. \$6.45 ea.



"BIG 12" ARC WELDING AND BATTERY CHARGING KIT

With Deluxe accessories consisting of one R1 300 amp generator, 30 feet welding cable, welder's adjustable helmet, electrode holder, 300 amp ammeter, 300 amp shunt, rheostat, toggle switch, 300 amp reactor coil arc stabilizer, voltage regulator, battery charging relay, one pair heavy duty welder's gloves. All units guaranteed pre-tested. Approx. Govt. cost \$750. Most items new—all perfect. Wt. 82 lbs. \$49.50



BIG NEW 1963 CATALOG!

Send 25c in coin for amazing new catalog with 1000's of surplus bargains in hydraulics, electrical, precision tools, marine items, automotive, etc. for hobbyists or industrial. Or order from this ad and receive a free copy. All prices F.O.B. Culver City, Calif. 50% dep. for C.O.D. Send check, cash or money order. Order today!

AIRBORNE SALES CO. INC. DEPT. PS563
8501 Stellar Drive • Culver City, California



EASY TO REPLACE



THIS MODERN WAY

Bilco®

AMERICA'S FINEST
BASEMENT DOOR

Here's the way to add amazing new beauty and convenience to your home. Replace that troublesome wood door with a modern Bilco. All steel, permanent, watertight, opens and closes at a touch. A new Bilco Door will do wonders for your home . . . and for you!

The Bilco Co., Dept. R-75, New Haven 5, Conn. Please send me your free illustrated folder and name of local dealer.

Name _____

Address _____

City _____ Zone _____ State _____

pole-vault authority, took movies of champion vaulters and analyzed their techniques frame by frame. He surprised the athletes by pointing out such major faults as waving of the pole during approach, failing to slide the hands together at takeoff, varying stride, even dangling legs. When the faults were corrected, heights went upwards.

Form perfection in pole vaulting is the principal reason for consistently climbing marks. But the use of fiber-glass poles also helps—which introduces the last major reason for those breaking records:

Better equipment

Just how important is the new pole? Dr. Ganslen thinks it highly overrated: "With the fiber-glass pole, the vaulter does less work at the start, but more at the end. . . . The pole has no energy except what the vaulter gives it. It's still the man on the end that counts," he says.

Veteran Cornelius Warmerdam, one-time 15-year holder of the world outdoor record, concurs. "The only difference is timing; some vaulters get as much bend out of steel poles."

But most disagree. Said vaulter John Cramer last summer: "I guess I'm the last man in the U.S. to use a metal pole. Looks like I'll be forced into changing. With fiber-glass poles, you can grasp a foot higher and hold on longer, and the pole itself acts somewhat like a catapult."

Kenneth Baldwin, sales manager for equipment-making Harry Gill Co. (which sells very few fiber-glass poles) puts it this way: "The nature of fiber-glass—its slow, unwinding action, yet its strength—has done the whole thing. Take a fellow like C. K. Yang [UCLA senior from Formosa], who goes 14 feet, 7 inches with an aluminum pole, then in his next competition makes 16 feet 3½ inches with fiber-glass. That was unheard of with metal poles. You had to work your way to heaven inch by inch; now you get there by the foot."

Another controversial piece of equipment is the javelin. Argument centers primarily around the "Dick Held" implement, developed by Dick and his javelin-throwing brother, Bud. The brothers started fooling around with javelin design in 1953, figured that by changing the shape, moving the center of gravity, and using stiffer material, two adverse factors could be eliminated:

1) quick dip of the point, causing the spear to drop too soon, and 2) in-flight wobble, resulting in increased drag.

Evidently they were right. That same year, Bud walked off with the world record of 263 feet, 10 inches—up more than 5 feet.

Crashing javelin records worried officials, old spear throwers, and investigators like Dr. Ganslen. He subjected Held's and conventional javelins to wind-tunnel tests, concluded that the increased surface area on Held's implements give them odd airfoil qualities. He raised the question as to "whether one wishes to throw javelins or gliders."

Replies Dick Held: "I think Dr. Ganslen's remark is off-base. . . . Why should the javelin man be content with throwing an implement which doesn't allow him to get the best results?"

The Amateur Athletic Union, the International Amateur Athletic Federation, and the Olympic Rules Committee seem to have agreed with Ganslen: Rules for javelin specifications were tightened. But records *continue* to be broken with a modified version of the Held spear.

Still more improvements

Less changed is another track-and-field missile, the discus, dimensions of which are painstakingly set down. Last June in Los Angeles, muscular Al Oerter, latest and best in a line of discus throwers that stretches back to ancient Greece, swung his right arm back, coiled and spun, and with a grunting explosion of breath whirled the maple-and-steel discus at 55 m.p.h. out past the 200-foot mark, breaking another "insurmountable" barrier.

What's his secret? The discus Oerter threw had a small innovation: The rim, ordinarily slick, was sand-blasted to provide a better grip. But the important thing in equipment, he told me, wasn't the discus at all. It was the new concrete surface he whirled upon.

"With concrete we don't have to wear spikes," he said. "On dirt you need them so you don't slip. But how do you spin on spikes?" On concrete, Oerter wears smooth-soled tennis shoes. (Great, bull-like hammer throwers, by the way, are now donning dainty ballet slippers, the better to spin with.)

Runners today are also finding some-

Science or Supermen?

thing new underfoot. Cinder tracks once were the thing, but they become uneven, mushy, tiring to run on—especially when wet. Resilient modern “all-weather” tracks (and field-event runways) are being topped with waterproof compositions of asphalt, cork, and rubber grounds. The University of Wisconsin resurfaced its track with the new material in 1959. In the first two Big Ten meets held there, 11 out of 13 records were broken.

Even the Russians are questioning their old cinder tracks. On the way to Philadelphia for a 1959 U.S.-U.S.S.R. meet, Russian trackmen insisted they'd not run on Franklin Field's newly installed resilient, all-weather track. A quick tryout changed their minds. Last October, Khrushchev Stadium in Kiev got a new track surface—startlingly similar to Franklin Field's.

Along with men, horses soon will be getting a break—and breaking more records. No more flying mud if a new Minnesota Mines product becomes universal. It's a less-than-inch-thick layer of synthetic resin topped with granules, laid over blacktop and stone. And last year, for the first time in the Indianapolis Speedway's 46-year-old history, cars sped over an all-asphalt track, covering the old rough and dangerous brick. Result: the fastest time ever. Rodger Ward averaged 140.292 m.p.h.

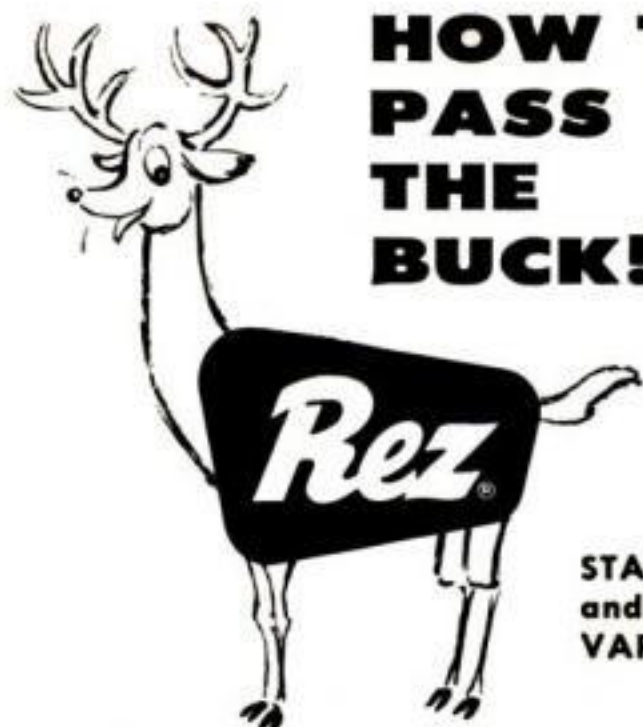
Even in golf, new equipment is lowering old scores. Main thing here is uniformity—clubs that really do match. According to Jack McGrath of Hillerich and Bradsby Co., club maker, the greatest single golfing advance came with the introduction of the steel shaft. Shafts used to be hickory, a fine material. But no two pieces of wood behave exactly alike. Steel pieces do. Same thing with the grip and the head. Now they're uniform and give predictably regular results. A top golfer today knows that if he hits the ball every time at the same angle with the same swing, it's flight will be the same every time.

Even the balls are consistent, with dimples aerodynamically designed and uniform. (A smooth golf ball, by the way, would travel a far shorter distance than the dimpled ball; the 5,000 r.p.m. backspin of a dimpled ball creates extra lift.) Take two balls at random today; you can rely on their going the same distance.

In football, the big thing is lighter equipment. Weight has dropped from around 21

CONTINUED

197



HOW TO PASS THE BUCK!

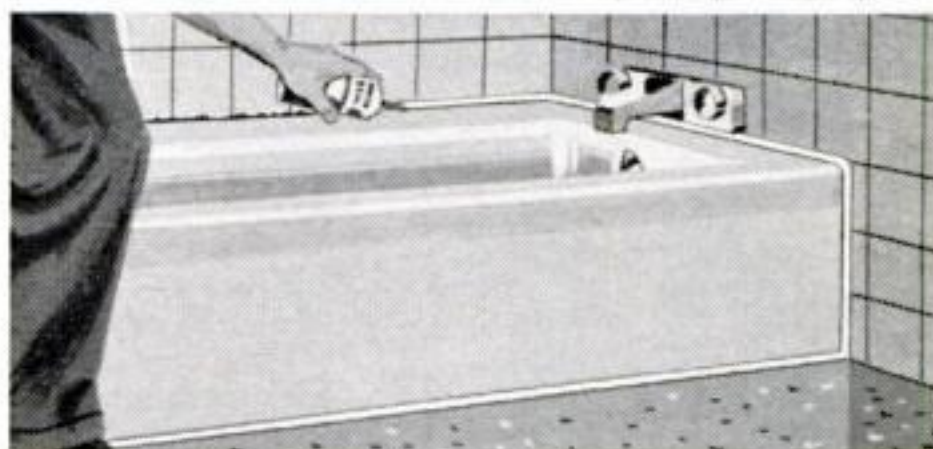
STAINS
and
VARNISHES

Here's one time you'll be happy to “pass the buck” because it will get you the 92-page REZ book, “BEAUTIFUL WOOD CREATIONS FOR YOUR HOME”. This colorful how-to-do-it guide introduces all REZ natural stains and varnishes and how to use them with all types of wood... plus, over 70 pages of easy-to-follow dimensional plans of wood projects inside or outside the home.

Only \$1.00

REZ WOOD-TONES, INC.
Dept. 135, P. O. Box 123, Springdale, Pa.

PUSH-BUTTON SEALER



...pressurized for instant flow



KWIK-SEAL® RAPID ACTION CAULK

‘Guns’ a waterproof, flexible white seal around tubs, tiles, showers, door and window frames. Two instant-change nozzles.

DAP INC., DEPT. 44, DAYTON 31, OHIO

ALL PURPOSE 3-IN-ONE® OIL Oils Everything Prevents Rust

REGULAR—OIL SPRAY—ELECTRIC MOTOR



It's hollow ground to bore cleaner, faster at any angle

NOW YOU CAN increase the boring range of your small electric drill or drill press. New Irwin Speedbor "88" bits bore faster, cleaner holes up to 1½" in any wood. ¼" shank chucks perfectly. No wobble, no run-out. Sharp cutting edges on Irwin exclusive hollow ground point start holes faster, permit spade-type cutters to bore up to 5 times faster. All Irwin Speedbor "88" wood bits are forged from single bar of special bit steel, tempered full length and machine-sharpened for extra accuracy, longest life. 17 sizes, ¼" to 1½". Buy individually or in sets from your Irwin hardware or building supply dealer.

Only 75¢ each, sizes ¼" to 1"

Only \$1.25 each, sizes 1 ⅛" to 1 ½"

IRWIN SPEEDBOR "88" WOOD BITS
at Wilmington, Ohio, since 1885



transistorized ignition system



TS-30
"Banshee"

ADVANCE STYLING AND DESIGN

Complete Banshee Systems are available in the following models:

- ☐ 30 KV Output with F-12T Coil, 250:1 turns ratio, neg. ground \$39.95
- ☐ 45 KV Output with F-400T Coil, 400:1 turns ratio, neg. ground 44.95
- ☐ 55 KV Output with F-500T Coil, 500:1 turns ratio, neg. ground 49.95
- ☐ Banshee TS-30 with F-500T, positive ground 59.95
- ☐ Free Color Brochure

TESTED • APPROVED • FULLY GUARANTEED ONE YEAR

SLEP ELECTRONIC COMPANY, Automotive Division
P.O. BOX 178-PS3, Ellenton, Florida Ph. (813) 722-1843

Name
Address
City State
YEAR MAKE MODEL

Science or Supermen?

pounds in the Thirties to about 12 pounds today. Use of the two-inch tee also has boosted scores; in the old days the ball was booted from a little mound of dirt. Another thing: No modern-day passer could get his favorite grip on those old fat, round balls.

All balls used in sport (except baseballs, insist the manufacturers) have been improved. Tennis balls are more uniform (as are the court surfaces); footballs are chemically coated to give a more "natural" feel and better grip; soccer balls and volley balls no longer bounce at a tangent. Basketballs are nearly two inches smaller than they were before World War II—and thus sneak through rims more often.

But if baseballs haven't changed, why is it that home runs are commonplace? (In 1909 Ty Cobb led the American League with nine homers; in 1961 Roger Maris hit 61.) According to some experts, it's the shape of the bat. "There's a vast difference between today's bats and those used, for example, by Ty Cobb," says Hal Schumacher, major-league pitcher from 1931 to 1946. Bats of the old era, he says, "tapered very gradually from the tip of the barrel end into a very thick handle."

Adds bat man Edwin L. Parker, president of A. G. Spalding: "Taller, heavier, stronger, faster baseball players using shorter and lighter bats are waiting longer for the ball and then are bringing those bats around very much faster."

And the gimmicks

Athletes today use many specialized techniques for improving performance:

- Swimmers remove all hair from their bodies to slice time by a few microseconds.
- Hockey players whiff pure oxygen for that extra spurt near the end of the game.
- Divers used to snug their knees under their chins; now they stick their heads between their knees, spin faster, get in more turns.
- Sharpshooters file down their handgun hammers; the weapons don't jar so much when they pull the trigger.

A hint: If you want to beat your own field record, compete near the equator—gravity is slightly less there. A Swedish shot putter at the equator should be able to add two inches to his home score, a broad jumper about an inch, and a javelin thrower more than a foot.

How to Fit Out an Econoline as a Camper

[Continued from page 127]

For additional cooking, a Harper oil stove sits on the cupboard next to the rear seat. It's handy for coffee-perking, says Hyman, and will also put out enough heat to keep the whole camper warm.

A marine-type pump faucet is mounted next to the sink, with its hose leading down to a water tank at the base of the kitchen unit. The sink drain is connected to another hose that runs to a waste container next to the water tank. An ice chest, stored under the sink, slides out on a clever drop-down shelf for easy access. There's practically no meal you can't cook with a setup like this.

Clothes and canned goods are stored in a closet unit that slips in behind the driver's seat as snugly as if it were built in. To avoid interfering with the battery box, which sits behind the driver's seat in the Econoline, the front portion of the closet is cantilevered out and has no leg.

Instead of carrying the closet all the way to the ceiling, Hyman simply extended the clothes rod on brackets. This gives enough height to hang suits and dresses full length without completely blocking the driver's rear view. The open top can be covered with a plastic bag or clear-plastic food crisper, says Hyman, if you want to keep dust off good clothes. The front bulkhead on the closet extends slightly beyond the closet itself on the left side and is curved to fit snugly against the wall of the bus.

A **three-way table** is another ingenious touch devised by Hyman. Made of two hinged sections, it can be fully extended to provide a large table area for the whole family at mealtimes. For playing games, writing letters, or helping the cook, the outer section can be folded down to make a small table that doesn't get in the way of other activities. For sleeping, both sections fold neatly out of the way against the wall.

A tricky mount hinges the table to the wall. It consists of two long T hinges bent at the ends to form hooks. These hook into a seam in the Econoline's wall paneling just below the windows. Another bend in the hinges allows for the thickness of the outer table section, which folds inside the inner section when both halves are collapsed. The drawers in the front bench are set 2" in from the wall end to allow them to open with the table folded. ■■

Briggs & Stratton — Clinton New Gas Engine Sale

Never before and perhaps never again—this offer of brand new genuine Clinton and Briggs & Stratton engines including 1 yr. factory warranty at less than cost. Perfect power for go-carts, scooters, tractors, mowers, generators, pumps, sprayers, etc. We bailed out 3 big factories who needed cash and the savings are yours while quantities last. Act fast.



Clinton 2 1/2 hp.
Mdl. A400—Re-coil
starter Std. 5/8 shaft
w. keyway—ready
to go. Reg. price
\$49.50. Special
(item 1002)

\$29.95

2 for ... \$57.50
6 for ... \$169.50



Briggs & Stratton
2 hp, Mdl. 60101
Rope start, std. 5/8
shaft w. keyway.
Sturdy 4 cycle power.
Reg. price
\$49.80 Spec. (item
106a) **\$29.75**

2 for ... \$57.40
6 for ... \$149.50

\$67.50

5 3/4 hp.

Briggs

&

Stratton



Briggs & Stratton 5 3/4
hp. Mdl. 143302.
Recoil start. Std. 1" shaft
w. keyway, aut. choke &
throttle control—a rugged
big engine ready to tackle
any job.

Regular price ... \$92.80
Special
(item 1059) ... **\$67.50**

2 for \$130.00 6 for \$350.00

2 1/2 h.p. Clinton—34.95

Rugged 4 cycle model 100. Alum.
block, castiron cylinder Rope start
—5/8" std. shaft

Item 1107 **34.95**

2 For **67.50**

3 1/2 h.p. Clinton—39.95

A big engine with big power. Mod-
el 406, 4 cycle, rope start, 3/4" std.
shaft.

Item 406 **39.95**

2 for **77.50**

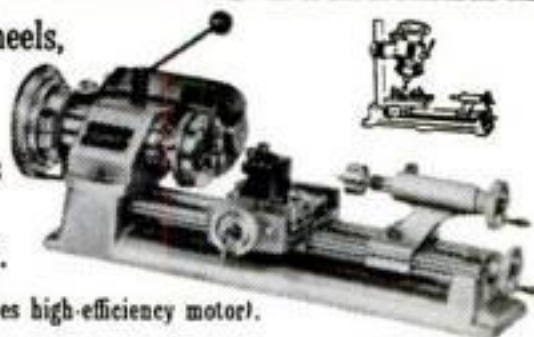
Remember these engines are absolutely perfect and standard and under factory warranty. Money back guarantee. Order now while stocks are complete. Factories—write us on any new items that are surplus to your needs. Send 10¢ for 100 page catalog.

MASTER MECHANIC MFG. CO., Dept. B-563, Burlington, Wis.

Southern Customers write Dept. B-563, Box 65, Sarasota, Florida

INCREDIBLE UNIMAT!

Makes gears, bearings, wheels,
axles, pinions, etc. Turns,
threads, bores, drills,
mills, grinds, buffs, polishes
...900-7200 rpm. Com-
plete machine shop in 16".



BASIC UNIMAT: \$139.50 (includes high-efficiency motor).
WRITE FOR FREE CATALOG.

SEE UNIMAT IN ACTION!

Unimat Handbook, "Miniature Machining Techniques", shows this precision machine tool in more than 180 action-packed close-up photos, 26 detailed line-drawings. Every set-up and attachment profusely illustrated and described. A lifetime of expert small-machining experience in 40 fact-filled pages. Just enclose \$1.00 for your Miniature Machining Handbook when ordering free Unimat catalog—study them before you buy!

AMERICAN EDELSTAAL, INC., DEPT. H-E, 350 BROADWAY, N.Y. 13, N.Y.

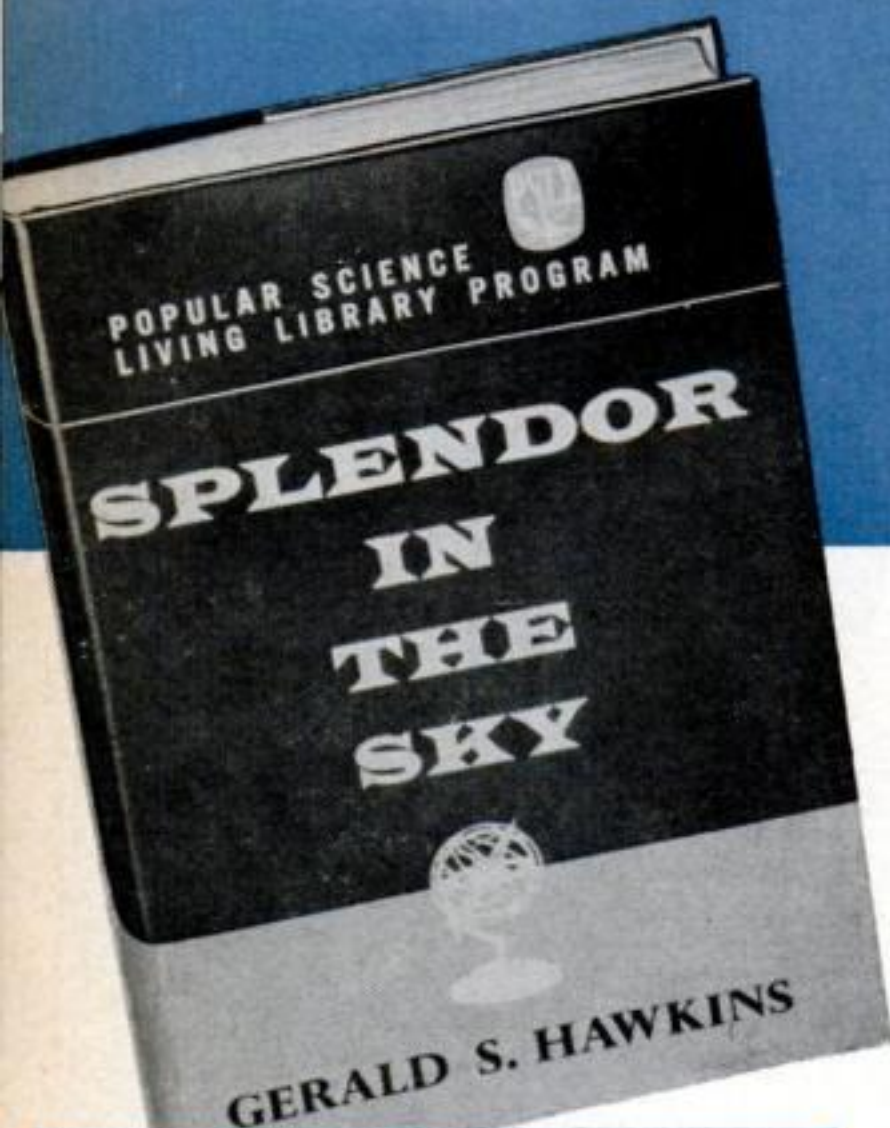
Keep Tools in Tip-Top Condition

Lubricate • Clean • Prevent Rust

3-IN-ONE® OIL

REGULAR—OIL SPRAY—ELECTRIC MOTOR

This fascinating book is yours for only 25¢ when you join the POPULAR SCIENCE LIVING LIBRARY PROGRAM



Here's What You Get As a Member of This Unique New Program!

- A 25¢ COPY OF *SPLENDOR IN THE SKY* IMMEDIATELY, along with your first selection, *SCIENCE IN EVERYDAY THINGS*.
- **FIXED LOW PRICE—EVERY BOOK CLOTH-BOUND.** All Living Library books are cloth-bound and priced at only \$1.95, regardless of higher regular prices.
- **FREE 10-DAY EXAMINATION OF EVERY SELECTION.** You *alone* decide whether you want the book or not. Books are always returnable, with no obligation.
- **YOU NEVER PAY FOR A BOOK UNTIL AFTER YOU'VE READ IT.** You must first be convinced that it is an outstanding bargain.
- **CHOOSE AS MANY OR AS FEW BOOKS AS YOU WISH.** No minimum number of books required. Take only what you like.
- **AUTOMATIC SHIPMENT OF SELECTIONS.** Books are automatically sent at exact 10½-week intervals—no forms to fill out, nothing to forget.

This completely new kind of book club was created especially for Popular Science readers. It is an exciting book program which makes it simple for you to build an ever-growing library of fact-filled, easy-to-understand science books at tremendous savings. In these fascinating books, you'll explore every aspect of modern science—from the atom to the human machine to the solar system.

By joining the Popular Science Living Library Program *now*, you immediately receive a copy of *SPLENDOR IN THE SKY* (publisher's edition, \$5.95) *for only 25¢*. You also receive your first selection, *SCIENCE IN EVERYDAY THINGS* (publisher's edition, \$3.95) *for only \$1.95!* Thereafter, you receive a new, exciting Living Library selection approximately every three months—at a *guaranteed* low price of only \$1.95.

You'll be delighted with your 25¢ copy of *Splendor In The Sky!*

To prove to you just how exciting membership in the Living Library Program is, you may have a copy of an exciting and beautifully illustrated volume on astronomy, for only 25¢: *SPLENDOR IN THE SKY*. This remarkable book, containing over 300 pages, unfolds and explores the mysteries and wonders of the planets, the stars, the galaxies beyond us.

Starting with the ancients, you are swept through the thrilling and turbulent days of great astronomical discoveries. You get a deeper understanding of the contributions of Copernicus, Brahe, Kepler, Newton. Rapidly opening to you are the secrets of our universe—our galaxy, stars, radio stars, clusters and super-clusters, meteors, comets, plus all the modern theories of the creation of our universe. It's an excitingly written book, lavishly illustrated with dozens of photos from the great observatories of the world, plus scores of explanatory drawings.

BUILD A VALUABLE SCIENCE



The Wonderful Human Machine



Mysteries of Mathematics



Flight to the Stars

YOUR FIRST CLUB SELECTION—AND EVERY OTHER SELECTION —COMES TO YOU FOR ONLY \$1.95

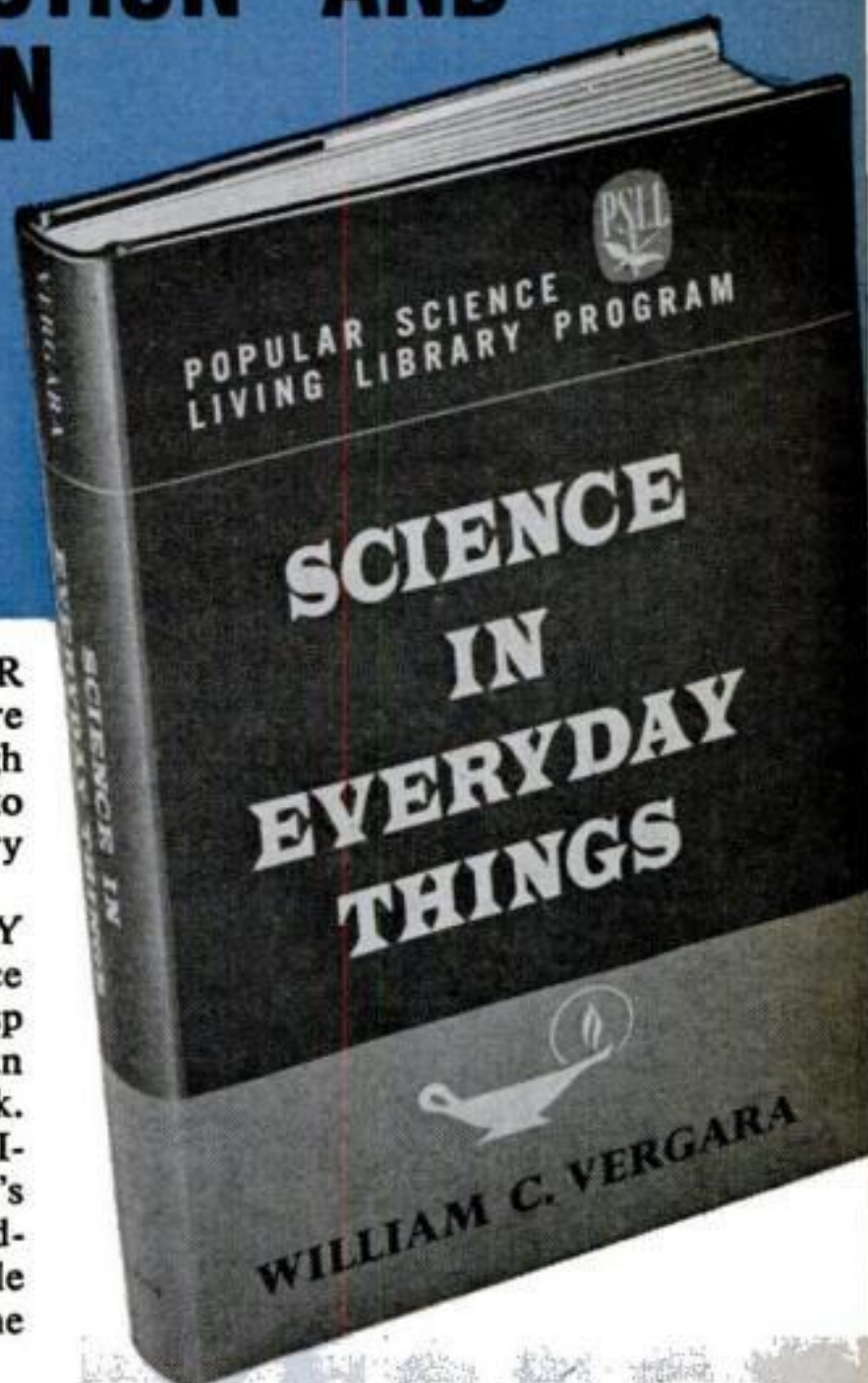
One of the many advantages of membership in the POPULAR SCIENCE LIVING LIBRARY PROGRAM is that books are never priced higher than \$1.95 (plus postage) even though regular prices are much higher. What a wonderful way to build a lifetime library of cloth-bound science books at very little cost!

You'll be delighted to find, as your LIVING LIBRARY grows, that your enjoyment and knowledge of modern science have deepened, that you have at your fingertips a ready grasp of subjects which may have baffled you before, that you can easily answer so many questions your friends and family ask.

As a member of the POPULAR SCIENCE LIVING LIBRARY PROGRAM, you will receive the cream of today's popularized science books. You never pay for a book in advance. We bill you later. All selections are fully returnable within 10 days. And, of course, you may resign from the PROGRAM at any time by simply dropping us a line.

Your future books will cover other thrilling science subjects!

New books in the POPULAR SCIENCE LIVING LIBRARY will cover such fascinating subjects as the living drama of medicine . . . the development of power from windmill to nuclear reactor . . . the conquest of space . . . the marvels of electronics and automation . . . dazzling developments in mathematics . . . lives of great scientists . . . the teeming life in the soil and much, much more! Drawing upon the riches of chemistry, biology, botany, archeology, atomic science, zoology, physics, meteorology, and all the other fascinating branches of science, the LIVING LIBRARY PROGRAM will bring you books that are masterpieces of simplicity and readability! Each one will be a valuable addition to your growing, comprehensive home science library! So, get on the road to the best science reading at the lowest possible prices, without risk! Mail the attached post-free card TODAY!



Science In Everyday Things—(Your first selection, only \$1.95). Here is a fascinating, easy-to-understand, 320-page book that answers hundreds of puzzling questions in clear, lively style. Why is the sky blue? Does light have weight? Can a jet shoot itself down? Can water boil and freeze at the same time? How much does the earth weigh? These questions, plus hundreds more, are answered fully and interestingly, in terms of the scientific principles involved. Illustrated with diagrams and drawings, the book covers just about every branch of science, and tells the whys and hows and whens behind common experiences and conditions. Hard cover, cloth-bound, colorfully-jacketed.

POPULAR SCIENCE LIVING LIBRARY PROGRAM
355 Lexington Avenue, New York 17, N. Y.

LIBRARY FOR ONLY 2¢ A DAY—MAIL CARD NOW!



The Drama of Medicine



The Amazing Animal World



Life Beneath the Sea

Can Detroit Move In on Indy?

[Continued from page 78]

Half of that confidence comes from the drivers he's signed. Foremost among them is world champion racing driver Graham Hill.

Let's take our own look at the hardy perennial champions—the Meyer-Drake-powered Indy roadsters. The severest critics of the Offy cars say they're everything a modern race car shouldn't be: overweight and unimpressively suspended; incapable of steering maneuvers more sophisticated than warping around left turns in splaying arcs; propelled by four-lungers dreamed up before Roosevelt ran against Hoover.

Yet the basic simplicity of the big bombers has always paid off in a race that's first and foremost an endurance contest. Gulping down a gallon of fuel every minute and a half, the Meyer-Drakes have what it takes to shrug off the punishment: relatively few parts, and years of conditioning. Add to that the engine's tremendous torque. The fewer the cylinders for a given displacement, the greater the twisting force. This is why the four-banger squeezes an amazing 420 horsepower from 255 inches.

The roadster chassis is something else. Considered an engineering triumph when it was introduced to the Speedway in '48, it's now admittedly obsolete.

What irritates the designers-mechanics who have nursed the chassis to the limit most is the visits Motor City engineers pay the track each year, to mosey in the pits and focus binoculars on the race. They'd learn a lot more, say the frustrated wrench artists, if they'd join us in an active program—and spend some money.

It's no secret, either, that the sponsors of this year's brand-name-engined race cars are on their own.

Body blow to name brands. But there's a growing belief the picture may change. Passenger-car merchandising didn't benefit from Indy participation 30 years ago. That was when Harry Miller's huge Specials took the show away from the last of the modified Buicks, Chryslers, Fords, Hudsons, Hupmobiles, Oaklands, Packards, Reos, and Studebakers. Coupled with that body blow, the Great Depression ended the customer-appeal of fuel-greedy chariots.

But now the accent is again on floor sticks and unbridled horses. Detroit has warmed to the stock-car races. There could be a reconciliation with the Speedway if the new contenders show up well. ■ ■

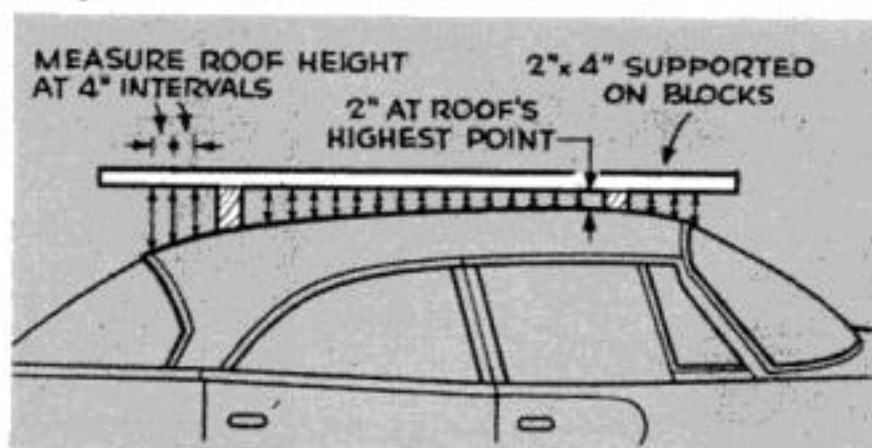
A Car-Top Sleeper You Can Build

[Continued from page 138]

The top half of the sleeper is a lightweight shell made of two curved side pieces with cross strips in between. The top can be covered with any material thin enough to take the 10"-radius curve at the front. Lindblad used $\frac{1}{8}$ " wood veneer covered with fiber-glass cloth for an extra-slick effect, but this isn't a must. Thin hardboard, sheet metal, or canvas, could be used.

In its raised position, the top is held by four telescoping poles, cleverly arranged to provide a rigid support—although the poles themselves are loosely pivoted. The secret: The poles all slant in toward each other. In order to swing outward, the top would have to be raised up and over the high point of the poles' arcs. Since the canvas enclosure is stretched taut between the top and bottom, this can't happen, and

How to find the shape of your car's roof



Level a two-by-four across blocks and measure down to roof at 4" intervals. Lay out a profile and cut sleeper's supporting ribs to this shape. Repeat the process for each rib location.

the entire assembly becomes a rigid unit. Hooks for the poles are bent bolts with their heads cut off.

The canvas enclosure is stapled inside the top, except for one short section, which is held by snap fasteners. This section can be opened to make an entrance. The lower edge is held entirely by snap fasteners so the top can be easily removed. You'll need eight yards of canvas 39" wide. Separate strips, 8" wide, are sewn near the bottom to overhang the rails and keep out rain.

Window openings are cut in the sides and can be covered in bad weather with flaps. When the sleeper is collapsed, the enclosure folds inward and stores itself without having to be detached. Small toggle-type luggage latches hold the top to the base in the closed position. ■ ■

SURPLUS SALE

GOVT. SURPLUS
EXCESS INVENTORY
BANKRUPT STOCK



ELECTRIC PUMP

• Runs on 12 volt battery. Centrifugal type. Many uses. Fine boat pump, fish ponds, etc.
Govt. cost \$64. SALE ... **\$8.96**

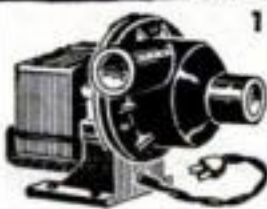


BATTERY HYDRAULIC PUMP

• Item #920. New electric hydraulic pump. Use on lift trucks, loaders, etc.
• Operates on 12 or 24-v DC.
1000 p.s.i. 1 to 3 gpm. Inlet and outlet ports, 3/8" pipe thread. Size 15"x7"x6".
35 lbs. Cost Govt. \$175. SALE..... **\$18.95**

HEALTH CHAIR MASSAGE MOTOR

• Item #1019. Brand new unit. Same used on expensive contour health chairs. Make vibrating chair. Useful for insomnia, aches, pains, sore muscles, etc.
• Consists of 115-v AC motor with double eccentric weight, etc. Easy attachment to chair. Wt. 6 lbs. Size 7"x2"x4".
List \$16.95. SALE..... **\$8.69**



115-V AC WATER PUMP

• Item #246. Genuine Surplus. Rupp electric pump. Use for draining, circulating, empty tubs, fluid transfer. Rustproof housing. Cap. 500 gph. 1" outlet and inlet. 7"x4"x4". Wt. 5 lbs. SALE... **\$7.97**

DIAL TELEPHONE

• Item #716. Std. phone, same used on all phone systems. Use as extension to main phone and on private systems. Directions furnished. Wt. 8 lbs. Cost \$25.
SALE **\$7.95**



AIR COMPRESSOR EQUIPMENT

• Make your own outfit. For painting, tires, shop use, etc. Save to 80%.
• Compressor, \$21.50. Govt. Tank, \$11.95. Gauge, \$1.75. Paint Gun, \$10.50. Auto switch, \$4.45. Air Regulator, \$3.95. Many other items.



SPECIAL OF THE MONTH!

PORTABLE GOV'T. SPRAY TANK



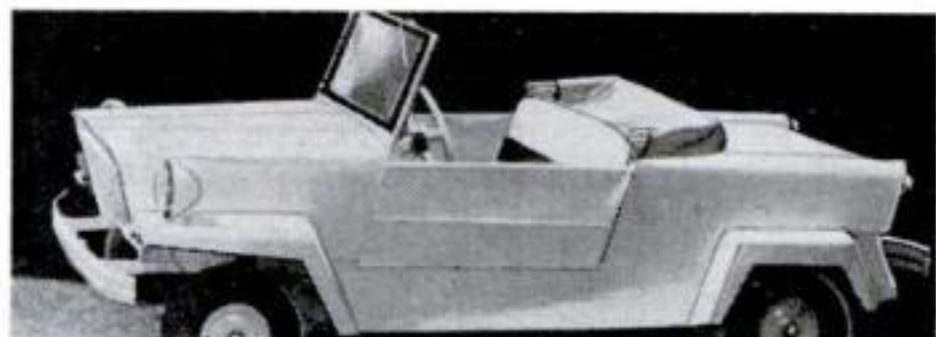
• Item #1810. Useful for spraying weeds, fertilizer, insecticide, etc. Fine unit for home owner, farmer, dairy, nursery, etc. Consists of 5-gal. tank with capillary feed tube, 60-lb. gauge, filler valve, liquid port, spray hose, nozzle, valves, etc. Pressurize at filling station. Size 26" high, 10" diam. Wt. 18 lbs.
Cost Gov't. over \$11.79
\$38. SALE..... **\$11.79**

HYDRAULIC SURPLUS BARGAINS

• Great savings. Build loaders, diggers, presses, etc. Brand new equipment.
• \$80 Pump, 1000 lb., 12 gpm... **\$33.95**
• Hand Hyd. Pump System & reservoir **29.50**
• \$69 Hyd. Cyl. 2 1/2"x16"..... **19.95**
• Hyd. 2-way 1000-lb. Valve..... **18.00**
All prices f.o.b. Lincoln. Include postage with orders, excess refunded.
WRITE FOR FREE 1963 CATALOG

SURPLUS CENTER

DEPT. 839, LINCOLN, NEBR.



KING MIDGET "World's Most Exciting Lowest Priced Car"

Drive it for 75c a week. Rider Agents Wanted. Send 25c for 32 page book, full details, dealer price. Or send \$1 (refunded first order) for this plus Service and Repair Manual and 16 5x7 photos of car and factory.

MIDGET MOTORS CORP., Athens 2, Ohio

JOINT AND SHARPEN ALL SAWS

Super Filer No. 11 joints and sharpens hand and circular saws 6" to 10" with all teeth correct in height, depth, pitch, bevel. When file hits steel roller, teeth are finished. Saw runs true with no side pull. Includes 8" file. **\$9.95 p.p.d.**

Write for Free Catalog
A. D. McBURNEY, 5908. Hollywood Blvd., Hollywood 28, Cal. Dept. S-53

SAW SET

automatically sets teeth at 10° or more \$2.95 p.p.d.



DRAINS cellars, cisterns, wash tubs; \$7.95 IRRIGATES - CIRCULATES - SPRAYS

1,001 uses. Stainless shaft. Won't rust or clog! Use 1/8 HP motor or larger . . . 3/4 HP for up to 2,400 GPH; 450 GPH 80' high; or 1800 GPH from 25' well. 1" inlet; 3/4" outlet. Coupling included free. **\$7.95.**
HEAVY DUTY BALL-BEARING PUMP. Up to 5,200 GPH; or 3,000 GPH from 25' well. 1 1/4" inlet; 1" outlet. **\$12.95**
Postpaid if cash with order. MONEY BACK GUARANTEE

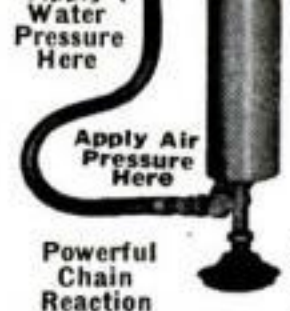
Centrifugal and Gear Pumps in All Sizes
LABAWCO PUMPS, Belle Mead 3, New Jersey

make your own Gems **36⁵⁰** FOB

The Gem Maker comes complete with all necessary equipment, including a super-charged diamond blade for sawing, and all the wheels for grinding, shaping and polishing; also complete instructions. The complete equipment as shown, less motor and belt for only \$36.50, f.o.b., Burlington, Wisconsin. Write today for information and literature.

B&I MANUFACTURING CO.
Dept. S Burlington, Wis.

POWER IMPACT GUN THINK OF IT! OPENS SEWER INSTANTLY!



Presto, one shot of this New PRESSURE GUN melts away grease, rags, detergent, roots . . . so effective removing all the scum clinging to the walls of pipe . . . trigger this IMPACT on stubborn SEWERS, SINKS, TOILETS, URINALS, BATHTUBS, SHOWERS, SEPTIC LINES 1/2" to 6" pipe 200 Ft. Get rid of Foul Odors, Bacteria, Sewer Gas. No need to remove pipe, wall or grease trap. Vents or Stacks are no obstacle as this Amazing Force strikes wherever water lays. Receive a FREE SKETCH of Plumbing Pipe-line in Buildings. But now—What is this POWER GUN worth to you in PLUMBING REPAIR COSTS. TIME AND LABOR SAVED? Tear this Ad out now—write your name & address beside it for FREE BOOK. Obey that urge. No Agent will call. A postcard will do. CHICAGO PHONE Kildare 5-1702 MILLER SEWER ROD CO., DEPT. PS. 4642 N. CENTRAL AVE., CHICAGO 30, ILL.

FREE BOOK
★ Tells How To Clean All Drains

DO MORE PLANING JOBS WITH LOW COST BELSAW



Exclusive MONEY-MAKING Features: Full 12 1/4" x 6" capacity • Power feeds at 14' to 34' a minute • Provides for Grinding Knives in the Cutter-head • Attachments for Jointing, Rabbeting, Tongue, Matching, Groove. Convert low cost rough lumber into high priced stock. Easy to make flooring and popular patterns. Send Today for FREE Literature and Prices.
Belsaw Machinery Co., 2063 Field Bldg., K.C. 11, Mo.

NEW CATALOG for CRAFTSMEN!

Workshop Supplies and Equipment, Kits Power Tools, Special Hardware All at Money Saving Prices

WOOD..

Get our new 132-page FULL COLOR Catalog. Finest domestic and rare imported hardwoods. Legs, mouldings, ornaments, mosaic tile, lamp parts, glue injector, upholstery supplies. Over 1,500 items. New project ideas and plans. Discounts on Stanley Tools. Send 25c for postage, handling.

CRAFTSMAN Wood Service, Dept. B-5, 2729 S. Mary St., Chicago 8

WELD FOR PLEASURE OR PROFIT
TRINDL INDUSTRIAL ARC WELDER

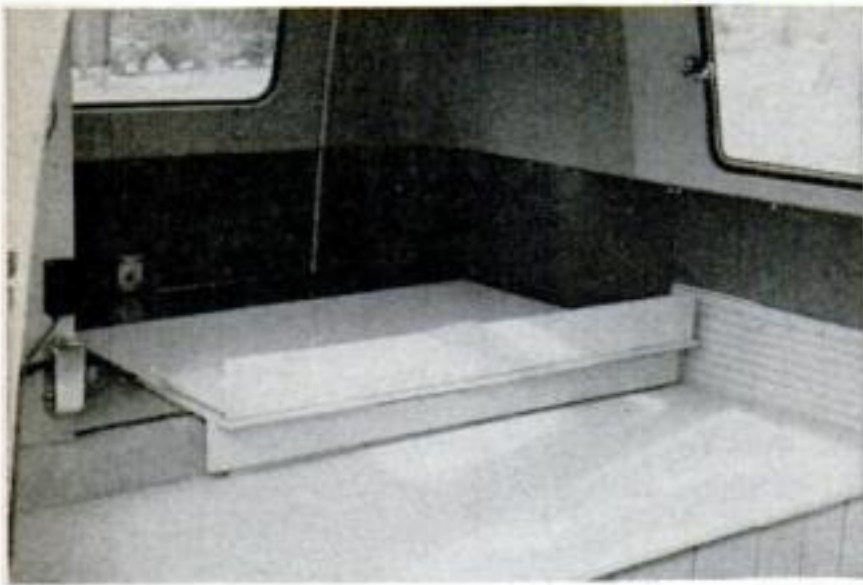
Own a Trindl 125 Amp Industrial Welder at less than smaller machines. Welds metals to 1/2" thick. Operates off properly wired 110 or 220 volt line. 16 heat stages from 20 to 125 amps. Make, repair anything of metal in the home, garage, farm or shop. No experience or training needed. Full "do-it-yourself" instructions. Guaranteed 12 months in continuous operation. Complete only \$98.50 FOB or write for details on 125A and other Heavy Duty Trindl Welders. Dealer Inquiries Invited.

Trindl Products, Ltd., Dept. T3-E, 1807 S. Clark St., Chicago 16, Ill.

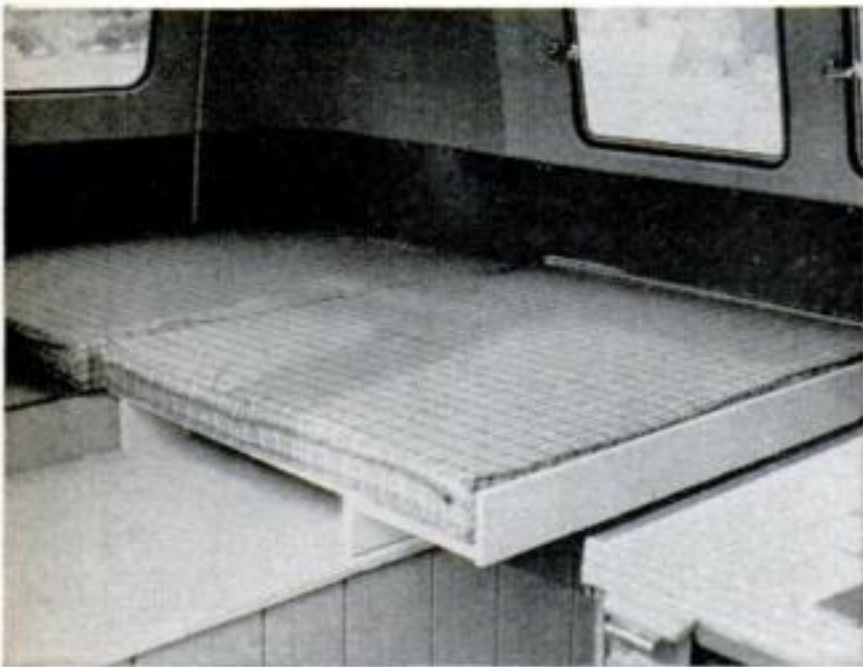
EASY TERMS
\$98.50 FOB

How to Fit Out a Microbus as a Camper

[Continued from page 130]

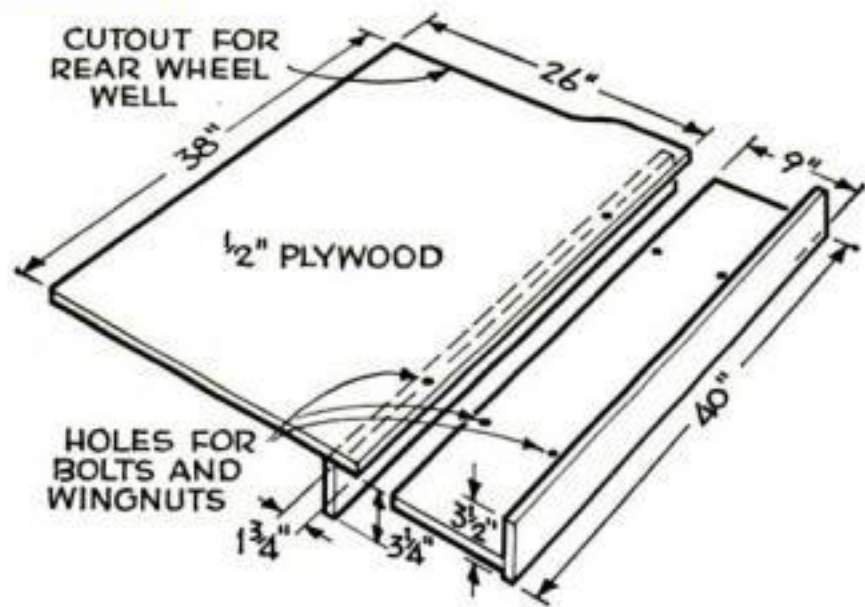


Double bed rests on removable platform extending out over the seat box. A separate lip is fastened to the underside of the platform with two bolts and wingnuts to hold bed cushions in place (lower photo). In the morning, the platform is slid back, and the lip is removed and bolted to its top (upper photo). Lip now serves as a back rest for the daytime seat cushions.



water up from a 25-gallon tank to an outlet hose at the side of the kitchen. It works like a faucet; flipping a switch starts the pump. Shutting off the pump stops the flow.

Geraci used a homemade tank that just fits the space at the back of the kitchen, but this isn't necessary. Any one of several



ready-made tanks can be fitted into the same space, or you can have a tank made at a sheet-metal shop. Two fill hoses are connected to the tank. One leads to a conventional trailer-type filler fitting mounted alongside the kitchen counter. This is used for pouring in water from a pail or pitcher. For faster filling, a second hose is fitted with a garden-hose connection for use when an outside sill cock is available.

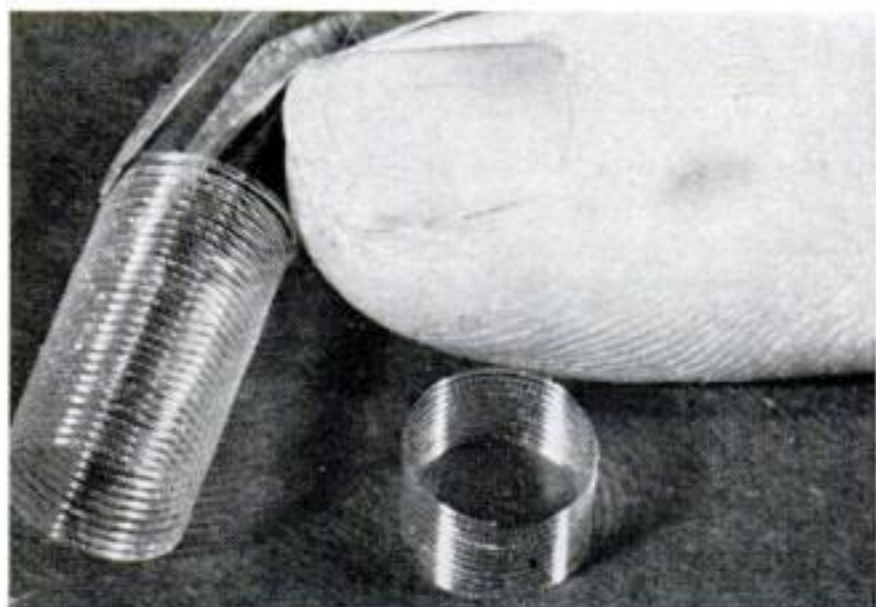
The kitchen unit includes shelves for canned goods, racks at one end for small jars and utensils, and a slide-out work table. A Bernz-O-Matic gas-electric refrigerator sits atop the rear seat box. It can be run on gas or on 12-volt DC or 110-volt AC.

The converter that Geraci uses to supply 110-volt current is housed in the seat box under the refrigerator, with slots cut in the sides of the box to vent the converter's heat.

There are no hinges on any of the storage compartments. The lids on the seat boxes simply lift off. They're kept from sliding by cleats on the underside. The doors on the clothes closet are held on by magnetic catches—the kind that are sold for conventional cupboards. But here there are catches on *both* sides of each door. ■ ■

Tiny springs made from quartz

Coiled from fused quartz half the thickness of a human hair, the little springs (right) are stronger than steel and incredibly accurate. They are said to be capable of measuring the gain in weight of feeding bacteria. They were made by two Lockheed missile-and-space engineers by wrapping the glasslike fiber around a slowly turning mandrel while heating with an acetylene torch. They are expected to aid in measuring gravity, earth shocks, electrostatic charges, electric pulses, and pressures.



World's greatest classified opportunities

POPULAR SCIENCE MONTHLY
355 LEXINGTON AVE.
NEW YORK 17, N. Y.

Classified Ads only \$1.20 per word insertion, payable in advance. Minimum ad 10 words. To be included in July issue, copy should be in our office by May 20. No cancellations accepted after May 15. All advertisers using post office box number in ad must furnish complete name and street address for our records. Address orders to O. K. Kelly.

1 AUTOMOBILES & MIDGET CARS

CROSLEY or Foreign car parts catalogue. Parts discount club. Box 7, Elmont, New York.

GO-KARTS \$29.95. Full Price less motor. Details 10c. Sportsmobile, 905 N. Broad, Philadelphia 23, Penna.

CROSLEY or Foreign car parts catalogue. Parts discount club. Box 7, Elmont, New York.

AUTOMOBILE literature, antique, modern. Catalogs, photos, manuals. Monthly Bulletin. Non-profit organization. Free information. Enthusiasts, Box 451A, Mount Clemens, Mich.

2 AUTO SUPPLIES & EQUIPMENT

SAVE Up To 50% on Auto Parts. Accessories! Get new 324-page Illustrated Catalog, just out. Over 100,000 items to renew, rebuild, renovate all makes, models, domestic, foreign cars, trucks, sports cars, from 1920 to 1963's; '28 to '31 Model A! Latest Hollywood accessories, custom and hi-speed equipment. Rush 25c for postage, handling—refundable on first order. Whitney, 1919-PS5, Archer, Chicago 16.

JEEP Parts! For Military and Civilian. At great savings. Largest inventory. Catalog for owners and dealers. Inquiries invited. American Auto Parts Co., 1830-PS Locust, Kansas City, Mo.

AUTO shop welding repair training in world's largest non-profit welding school. Low tuition. Free booklet. Hobart Welding School, Box P-53, Troy, Ohio.

FREE Trial. \$3.00 Motolife Treatment. Pay If Satisfied. Neher, La Verne, Calif.

HYDRAULIC Jack Repair Parts—"Sava-Jack," hard-to-get genuine metal replacement parts; "Econo-Pak" bulk items; "Jackmaster" repair kits; catalog 25c in coin. Hydraulic Jack Packing & Tool Co., P.O. Box 50, Bloomfield, N. J.

FORD T and A parts? Try best source old model parts, all makes. Pistons, gaskets, gears, valves, waterpumps, etc. "Antique Parts," Milwaukee 4, Wisconsin.

BATTERY chargers . . . home type. Electroton's famous line. Wholesale prices. Same day delivery. Free catalog. Write Dept. D, Doron Enterprises, Inc., Box 7214, Chicago 80, Ill.

FOREIGN Car Parts—Quick delivery, big savings. For complete catalog send Name, Address & 25c to: Tibur Imports, Dept. PS, P.O. Box 6194, Chicago 80, Ill.

RING-Valve Job while driving, \$6.00 postpaid. Guaranteed! Nothing like it! Many mechanics recommend! Motaloy, Grantham 27, Penna.

PARTS Model "A." List 25c (Refundable) Matco, Box 135, San Pedro, Calif.

TRANSISTOR Ignition. 260/1 Coil. Manual, Special—\$8.50. Anderson Engineering, Wrentham, Massachusetts.

TRANSISTOR Ignition. Save gas, tune-ups. Points, plugs last longer. Improved cold starting. high-speed performance. Complete systems from \$34.50. Free Literature. Dealers invited. Palmer Electronics, Dept. P, Carlisle, Massachusetts.

JEEP Owners—V8 conversions. Read Jeep Owners ad, page 45.

USE THIS HANDY INDEX TO FIND WHAT YOU WANT

Advertising, Agencies for Advertisers . . .	53
Agents Wanted . . .	43
Antiques, Relics & Indian Goods . . .	29
Art Instruction, Cartooning, Sign Painting . . .	54
Astronautics . . .	5A
Authors Service . . .	52
Auto Supplies & Equipment . . .	2
Auto Trailers . . .	3
Automobiles & Midget Cars . . .	1
Aviation . . .	5
Batteries, Generators, Etc. . .	6
Boats, Outboard Motors . . .	11
Body-Building Courses, Jiu Jitsu, Etc. . .	12
Books & Magazines . . .	23
Business Opportunities . . .	37
Business Service, Information, Name Lists . . .	50
Buy It Wholesale . . .	38A
Coins & Currency . . .	26
Cameras, Photo Supplies . . .	34
Camping Equipment & Tents . . .	16
Detectives . . .	47
Dogs, Birds, Hamsters & Pets . . .	17
Earthworms, Crickets, Frogs . . .	18
Educational & Instruction . . .	45
Electrical Supplies & Equipment . . .	7
Employment Information . . .	42
Engines, Motors, Etc. . .	10
Farms, Other Real Estate . . .	19
Field Glasses, Telescopes . . .	14
For Inventors . . .	60
For Sale Miscellaneous . . .	71
Formulas, Plans, Etc. . .	39
Garden Supplies & Equipment . . .	10C
Government Surplus . . .	11A
High-Grade Salesmen . . .	44
Hobbies, Collections . . .	31
Home Craftsman . . .	65
Hypnotism . . .	24
Import-Export . . .	38B
Inventions Wanted . . .	61
Investments . . .	37A
IQ Tests . . .	51A
Language Outfits . . .	48
Loans By Mail . . .	80B
Machinery, Tool Supplies, Etc. . .	9
Magic Tricks, Puzzles, Etc. . .	25
Minerals & Precious Stones . . .	30
Miscellaneous . . .	79
Models, Model Supplies . . .	64
Money-making Opportunities . . .	38
Motion Pictures & Color Slides . . .	33
Motorcycles, Bicycles & Supplies . . .	4
Musical Instruments and Song Writers . .	35
Of Interest To Women . . .	70
Old Gold, Jewelry, Watches . . .	67
Patent Attorneys . . .	59
Patents For Sale . . .	62
Personal . . .	80
Photograph Records . . .	35A
Photo Finishing, Photocopies, Etc. . .	32
Plastics . . .	40
Printing, Multigraphing, Etc. . .	57
Printing Outfits, Supplies . . .	58
Profitable Occupations . . .	22
Radio, TV, Electronics, Hi-Fi . . .	36
Razor Blades, Shavers . . .	74
Remailing Service . . .	80A
Rubber Stamps & Office Supplies . . .	56
Science & Chemistry . . .	41
Special Services . . .	51
Sporting Goods, Guns, Fishing Tackle, Etc. . .	15
Stamp Collecting . . .	28
Tattooing Supplies . . .	75
Tobacco & Pipes . . .	68
Treasure Finders & Geiger Counters . .	77
Trees, Shrubs, Roots & Herbs . . .	20
Typewriters & Office Machines . . .	55
Wanted to Buy . . .	72
Watch Repairing . . .	78
Welding, Soldering . . .	8

3 AUTO TRAILERS

PICKUP Campers. Pre-cut Kits. Blueprints. Supplies. Literature 10c. Comstock Trailers, Parsons, Kansas.

BUILD Expanding Eight Foot Trailer. Accommodates Five. Literature 10c. Framar Company, Wilmington, Mass.

4 MOTORCYCLES, BICYCLES AND SUPPLIES

RECONDITIONED Motorcycle Motors. Large Stock Indian, Cushman, Vespa, Mustang, NSU Parts. Indian Motorcycle Sales, Kansas City 27, Missouri.

SPEED cams for Motor Scooters, 3/4 Midgets, \$15.00—Your Core. 50c for Auto Catalog. Weber Speed Equip., 310-C So. Center, Santa Ana, Calif.

BMW Motorcycles, shaftdrive, U.S. Distributor Butler & Smith, Inc., 160 West 83rd St., New York 24, N. Y.

CONVERT Bicycle To Motorbike. Plans . . . \$1.00: Go-Byk Industries, Fergus Falls, Minnesota.

MINIBIKE \$15. Gocart \$15. Servicycle \$25, less engines. Engines \$4 up. Moped \$30. Vespa \$50. Harley \$25. Isetta \$175. (Mailorder only). Send 25c (35c for First Class Mailing) for Directory—Catalogue Number 113, listing these and Hundreds of similar bargains, homebuilders parts, plans, etc. Midget Motors Directory, Athens, Ohio.

ADAPTER Kit—\$29.95. Bicycle Engine Mount Company, Box 214081, Sacramento 21, California. Literature 10c.

SCOOT'R-Bike: build from bicycle frame, go-cart wheels; Plans \$1.50, refundable; Kits \$9.95. Gilliom Manufacturing, St. Charles 15, Missouri.

BUILD Your Own Cart, Trail or Mini Cycle frame for Less Than \$10! Save 50%! Buy Kits, Parts at discount prices! Plans with information Only \$2 each. Money Back Guarantee. Cycle-Cart, Dept. PS5, 2518 W. Cahuenga Blvd., Los Angeles, California.

BANKRUPT. Motorcycle Bargains, Wholesale Parts, New, Used. Directory 35c. Bunico, 146-5G, Covington, Virginia.

MOTORIZE your bike, using "Nimpow" rear engine mounting kit. Literature 50c, refundable with purchase. Roycraft, 222K West 39th, Kansas City 11, Missouri.

MINI-Bike, Go-Kart, parts, accessories, frames, engines. Send 25c for 32 page catalog. Jerry Staver, Box 511-P, Janesville, Wisconsin.

5 AVIATION

PROPELLERS for Airboats, Snowplanes, Icesleds. Beautiful Colors. Boat Kits, Mounts, World's Best. 25c for Catalog. Aerial Propeller Company, Box 692, Greenville, Texas.

PROPELLERS. Plans, Supplies for airboats, snowplanes. 125 H.P. Lycomings, 150 Continentals, \$125.00. Hubs, parts, gauges, throttles, spark plugs, wires, hose, oil Coolers, gaskets. Catalog 25c. Banks-Maxwell, Box 3301G, Ft. Worth 5, Texas.

POPULAR SCIENCE OPPORTUNITIES

USAF-USN Flight Clothing & Equipment. Catalog 25c. Dave's Army & Navy Store, 1404 W. Susquehanna Ave., Dept. B, Philadelphia 21, Penna.

5A ASTRONAUTICS

ROCKETS: New illustrated catalog 25c. Single and Multistage Kits, Cones, Engines, Launchers, Trackers, Technical information, etc. Fast Service. Estes Industries, Penrose 32, Colorado.

6 BATTERIES, GENERATORS, ETC.

REBUILD Batteries! Complete Manual \$3.00. C.O.D.'s Accepted. Bayer Publications, 938 Betty Avenue, Neenah, Wisconsin.

7 ELECTRICAL SUPPLIES & EQUIPMENT

ELECTROPLATING Equipment And Supplies. Send \$1 For Formulas, Equipment Guide, Operating Data And Catalog. Hollywood Bronze Supply, Dept. N7, 3445 Union Pacific Ave., Los Angeles 33, Calif.

ELECTRICIANS:—Get Kel-Ko, 4-way BX Cable Holder. Perfect Time-saver. Guaranteed! \$1.35 each; 2 for \$2.50 postpaid. Kel-Ko, Box 2025, Kettering 29, Ohio.

LAMP—Appliance—Vacuum parts. Wholesale lists sent free. Seco, 112 South 20th Street, Birmingham 3, Alabama.

\$1.00. **DELAY** Switch For Porch, Garage Lights. Bracken Co., 13576 Davenport, Pacoima, Calif.

8 WELDING, SOLDERING

HEAVY Duty 110 Volt ARC Welder. Generates Heat To 6000 Fahrenheit For Cutting. Complete with Helmet, Gloves, Rods. Instruction Book, Etc., \$19.00. Fully Guaranteed For Five Years. If You Are Not Satisfied Your Money Refunded Within 7 Days. National Electric, P.O. Box 678-B, Miami Beach 39, Florida.

PRODUCTION Welders, 110/220 \$69.50, \$39.50. Morris, 1070 Inner, Schenectady 3, New York.

FREE Catalog, Welders, Kits. Build 350-ampere welder using aircraft generator, plans 25c. Dunbar, Minneapolis 8, Minn.

9 MACHINERY, TOOL SUPPLIES, ETC.

MACHINIST Tools Factory Direct. Campbell Tools, 1424 Barclay, Springfield, Ohio.

10 ENGINES, MOTORS, ETC.

DIESEL Injector Parts and Fuel Pumps Wanted GM51-53-71-110. Mayer, 2093 East 19 Street, Cleveland 15, Ohio.

REWIND Motors yourself. Complete instructions \$1.00. Lewis Manufacturing, Howell 11, Michigan.

10C GARDEN SUPPLIES AND EQUIPMENT

LAWN MOWER Parts Wholesale Catalog Free To Dealers And Repair Shops. Ellwanger, 15 Canal Street, Port Jervis, New York.

11 BOATS, OUTBOARD MOTORS

WHY dream of owning a boat? Build one now! Custom Craft, originator of marine engineering marvels, offers prams to cruisers, sailing dinghies to dragsters in the 20th Anniversary Catalog. Prepaid Freight. Financing can be arranged. Send 50c to cover handling to Custom Craft, 1700 Niagara Street, Buffalo 7P, New York.

FULL size, cut-to-shape boat patterns, blueprints, 7½-38 feet. Big new illustrated "Build a Boat" catalog of 64 designs, including Catamarans, Cruisers, Runabouts, Skiffs, Outboard Boats, Sailing, Racing, Houseboats, 50c. "How to Build a Boat" booklet, \$2.50. Cleveland Boat Blueprint Co., Box 1651, Cleveland, Ohio.

MARINE conversion equipment, gears, accessories—Chevrolet, Ford, Buick, others. Catalog 25c. Star Marine Engine Works, 2920—7th Street, Berkeley, California.

BOAT Plans, Frame Kits, Full-Size Patterns! 80-page catalog illustrating over 40 Build-it-Yourself boats 50c. Glen Marine, 9152 Rosecrans, Bellflower, Calif.

FIRST Plan and Pattern Catalog in two years to offer every conceivable type craft, including class sail boats for any size budget—"A Book Worth Keeping." Send \$1.50 to Custom Craft Plan Division, 1700 Niagara Street, Buffalo 7P, New York.

ALUMINUM Boat Kits, \$38.50 up. Assembled in a week-end from factory finished aluminum parts. No riveting, no bending, no guesswork. Save up to 60% of factory built prices. The perfect light car toppers for the sportsman. Models up to 14 feet. Send 25c for new catalog. Alumakit Co., Inc., Dept. PS-53, Salem, Mass.

NEW, used, rebuilt marine motors. Marine conversions, fittings. Free Catalog. Stokes Marine Supply, Dept. 23, Coldwater, Mich.

FIBERGLASS Cloth, Matt, Polyester and Epoxy Resins. Lowest prices. Seifert's, Box 1206-X, Green Bay, Wisc.

PLANS, patterns, kits. Catalogs: Powerboat 50c, Sailboat 40c, Trailers \$77.95 up. Marinecraft, Box 161-P, Brighton, Mass.

11A GOVERNMENT SURPLUS

JEEPS \$111.68, Airplanes \$75.20, Boats \$6.18. Many others direct from U.S. Government. For complete "Directory" send \$1.00 to Quality Surplus, Box 22163-P5, Indianapolis 22, Indiana.

GOVERNMENT Surplus Direct From Government. Jeeps \$264.00, Radios \$2.53. Typical Prices. Guns, Typewriters, Cameras, Tools, Thousands More. Amazing Low Prices. How, Where To Purchase, Merchandise Available, Etc., Only \$1.00 To: Surplus, P.O. Box 50512, Dept. F, New Orleans 50, Louisiana.

JEEPS—\$223.83, Typewriters—\$4.15, Radios—\$2.65, Boats—\$6.18, Televisions, Guns, Cameras, Recorders, Watches, Typical Surplus Prices. Exciting Details Free. N. Y. Enterprises, Box 402-S6, Jamaica 30, New York.

JEEPS \$111.68, Airplanes \$75.20, Boats \$6.18. Many others direct from U.S. Government. For complete "Directory" send \$1.00 to Quality Surplus, 4544 East 14 Street, Dept. P5, Oakland 1, California.

JEEPS \$111.68, airplanes \$75.20, boats \$6.18. Many others direct from U.S. Government. For complete "Directory" send \$1.00 to Quality Surplus, 512 Interurban Building, Dept. P5, Dallas, Texas.

JEEPS \$111.68, boats \$6.20, airplanes, walkie talkies, guns, cameras, thousands of items typically at 90% savings or better. For complete information send \$1.00 to Surplus Service, Box 820, Holland 2, Michigan.

JEEPS—\$111.26, Boats—\$6.38, Typewriters—\$4.17. Thousands items direct from Government in your area. Complete "Guide," \$1.00. Surplus Information, 1402-PSS, Englewood, Colorado.

GOVERNMENT Surplus How and Where To Buy In Your Area. Send \$1.00. PS Surplus Information, Headquarters Building, Washington 6, D. C.

NEW Procedure! Get listed free! Buy Single, Government Surplus Items thru recently established Government Agency. Satisfaction Assured! Details \$1.00. Hazlett, 2 Bayview Ave., Penns Grove, New Jersey.

JEEPS, airplanes, boats, tools, electronic gear, etc. You buy direct. "Locations and Procedures" plus "Profits From Surplus," \$1.00. Tangent, Box 6091-B5, Dallas 22, Texas.

12 BODY-BUILDING COURSES, JIU JITSU & ATHLETIC EQUIPMENT

"GIANT Arms." Dr. Young's, D. C. Revolutionary discovery. \$2. Satisfaction or refund. Gaucho, Box 9309-S6, Chicago 90.

BUILD powerful arms, chest, shoulders! 22 exercises, \$1. Fonsad, Box 601-C, 1100 Market, Wilmington 99, Delaware.

BIG Muscles Fast—Gain up to 4" on arms, 10" on chest in just 7 weeks. Free details. Sinkram Body Builders, Dept. SC-13, Box 11, Brooklyn 36, N. Y.

KARATE, Judo Books: Send 25c Coin For Descriptive Lists To: Aardparke Books, Box 395PS, Tarzana, Calif.

OUTSTANDING Physical Development! Any age. New Guaranteed Discovery uses only a Rope! Strength, Health, Muscles. Gain—Reduce. Free information. Roper-cise, 4834-A Art, San Diego 15, California.

PHYSICAL Perfection: Reducing, Gaining, Muscles, Longevity. Mail 25c for all 4 courses. Guaranteed. To: Sid's System, (PS-M-63), 8421-C Evergreen, Southgate, California.

"KUNGFU Iron Hand," "Kungfu Poison Hand," "Chinese Gungfu Defense," "Prof. Wong's Kungfu," \$5.00 each. Free Literature, Karate, Judo, etc. Oriental Book Sales, P.O. Box 1183, Oakland 4, Calif.

BAR-BELL Course, illustrated \$1.00. Catalogue 10c. Good Barbell, B-1495, Hendersonville, N. Car.

ISOMETRIC Contractions: Ultraefficient muscle building method; equipment, long workouts unnecessary. Complete principles, exercises \$2.00. Isometriks, 658 Fairview, Oakland 9, California.

PUSHED around? Don't take nonsense from bullies. Surprise them. Easy when you know Police Jiu Jitsu. Complete illustrated course in one volume. Send \$1. Now. Satisfaction guaranteed. Books Publishing Co., Amityville 39, New York.

14 FIELD GLASSES, TELESCOPES

BUILD your own Reflector Telescopes. Complete kits; Mirrors, Eyepieces, Tripods, all other accessories. Request free illustrated literature. Criterion Manufacturing, Dept. KP-2, Hartford 1, Conn.

SCIENCE Bargains! Lenses, Telescopes, binoculars, microscopes, kits, parts, war surplus. Send \$1.00 for beginner's 10-lens kit with instruction booklet. Order Stock 2-CN. Request Free 144-page Catalog CN. Edmund Scientific Co., Barrington, New Jersey.

DYNASCOPE—Amazing world famous reflector telescope. Request free brochure. Criterion, Dept. DS-9, Hartford 1, Conn.

FREE Catalogue! Thousands war surplus optical bargains. Lenses, Prisms, Telescopes, Binoculars, etc. Send \$1.00 for 10 Lens Hobbyist Set and Project booklet. G. Jaegers, 691 West Merrick Road, Lynbrook, New York.

15 SPORTING GOODS, GUNS, FISHING TACKLE, ARCHERY, TRAPPING

FOCUS on target, split image Hunting Rangefinder instantly shows true range for deadly accuracy every shot. Perfect for varmints. Also Golf and Archery models. \$9.95 up. Free literature. Federal Instrument, 92-60B Queens Blvd., Rego Park 74, N. Y.

10,000 GUN Bargains!!! Modern—Antique Guns—Accessories . . . Giant 128 Page Bargain Catalog \$1.00. Agramonte's, Yonkers, N. Y.

FREE . . . Wholesale Catalog. Beads, Spinners, Lure parts, Sinkers molds, Jigs, Reels, Finny sports, (PE), Toledo 14, Ohio.

FISHERMAN'S Dream Book—Free! 170 pages. Sweetest pocket size catalog ever. Do-It-Yourself stuff galore: Net Making, Turtle Trapping, Sinkers Casting, Worm Manufacturing, Fly Tying, Fish Smoking. Component parts to make great fish getting lures. Everything is here including latest rods, reels, 'n gadgets. Send Postal card: Netcraft Co., Dept. PS, Box 5510, Toledo 13, Ohio.

5000 GUNS, Swords, War Relics. Catalog 50c. Smith Museum, Runnemede, N. J.

B.B. SHOT, invention only 2" long shoots B.B. with amazing power, accuracy. Complete with B.B.'s dispenser, target, extra velocity cone. \$1.98 ppd. Guaranteed. Grayson Products, Dept. E-44, 210 Fifth Ave., N.Y.C. 10.

CANNON Fuse 3/32" Diameter, Waterproof, Burns Under Water: 10 Ft.—\$1.00. 25 Ft.—\$2.00. Postpaid. William Zeller, 10-A, Hudson, Michigan.

PUTTER croquet style "Little Magician." Dead center accuracy. \$6.95 Prepaid. Check or M.O. Home Industries, 336 Athens Street, Jackson, Ohio.

JAP rifles altering American shells \$6.00. Jap shells \$3.95, catalog 10c. TP Shop, West Branch 10, Michigan.

POPULAR SCIENCE OPPORTUNITIES

16 CAMPING EQUIPMENT & TENTS

TENTS, 300 styles (most erected on display), Camping Trailers, Sleeping Bags, Tarpaulins, Flies, Canvas Yard Goods, Aluminum Tent Poles, Stakes, Cots, Tables, Refrigerators, Stoves, Lanterns, Heaters, Cook Sets, Canteens, Mess Kits, Water Bags, Packs, Rucksacks, Dehydrated Foods, Camping Books. Send 25c for new giant catalogue, (includes camp sites and complete handbook). Morsan Tents, 810-G Route 17, Paramus, New Jersey.

GIGANTIC 1963 Catalog—the "Bible" for every camper—116 pages fantastic savings on tents, sleeping bags, camping gear, clothing and government surplus! Choose from our \$1,000,000.00 inventory and save! Send 25c today for catalog. I. Goldberg, Dept. P.S., 429 Market Street, Philadelphia 6, Pennsylvania.

FREE Folder on newest Heillite camping trailers, \$575-\$745. Make camping fun for entire family! Compact, foldout models engineered for rugged back country travel. Heillite, 1377 So. Sacramento, Lodi, California.

17 DOGS, BIRDS, HAMSTERS, RABBITS & PETS

RAISE Rabbits on \$500 month plan. Free details. White's Rabbitry, Mt. Vernon, Ohio.

LIVE Seahorses, marine specimens, aquarium supplies. Illustrated catalog 10c. Marine Life, Dept. 107, Box 626, Dania, Florida.

TRAINED, registered Beagles \$25. Puppies \$20. Catalog 25c. Clayco Beagles, Henrietta, Texas.

EARN \$10,000 yearly raising Angora Rabbit Wool for us. Information 25c coin. American Angora Company, Malta 1, Montana.

DESCENTED Skunks \$9.99. Price List 10c. Animal World, Elwood, Kansas.

18 EARTHWORMS, CRICKETS, FROGS

EARN Money raising fishworms for us! Exciting details free! Oakhaven-121, Cedar Hill, Texas.

FREE Literature—We teach you how to raise, sell fishworms, crickets. Hybrid redworms 3000—\$5.95, 5000—\$8.95, 10,000—\$16.95, Postpaid. Carter Farm-12, Plains, Georgia.

MEN!—Women! Make Money Raising Bait for Us at Home. Free Details. Red Wigglers, Warsaw 3, Indiana.

AFRICAN Worms—Large, 500—\$7.00, 1,000—\$12.50. Junior Bait Size, 500—\$5.50, 1,000—\$10.50, postpaid. (Dealers Wanted) Ozark Worm Farm-V, Willow Springs, Missouri.

19 FARMS, OTHER REAL ESTATE

CANADIAN Lands, seized and sold for taxes. Our 46th annual series of lists describe many choice properties, situated from coast to coast, acquired by us through Tax Sale. Priced as low as five dollars per acre, guaranteed perfect title, small monthly payments, no mortgage. Beautifully situated hunting and fishing camps, where there is real sport; summer cottage sites, heavily wooded acreages. Now is the time to invest in Canada's minerals, forests and farms. Write to-day for free twenty page booklet with full explanation. Tax Sale Service, Room 301-H, 85 Bloor Street, East, Toronto 5, Canada.

FLORIDA Campsites—deep in the heart of the great Ocala National Forest. Abundance of game, best fishing. Warranty deed. Unrestricted—pitch tent, park trailer, build lodge. Free maps and photos. Winfree Vernor, DeLand, Florida. AD-60088(Q-O)

NEW Homes From \$35 per month. Nothing Down, Custom Constructed on your lot. Over 88,000 Built. Free information and illustrated brochure. Jim Walter Corporation, Box 9128, Dept. PS-5, Tampa, Florida. 212 branch offices to serve you.

STROUT Catalog—Free! Spring edition. Thousands on New properties Coast-to-Coast—Farms, Homes, Recreation, Business, Retirement. World's Largest! Strout Realty, 50-ZB E. 42 St., N. Y. 17, N. Y.

CANADIAN Vacation Lands: Full price \$385.00. 40 acres, \$10 month. Suitable cottage sites, hunting, fishing, investment. Free information. Land Corporation, 3768-D Bathurst, Downsview, Ontario, Canada

\$1 ACRE—Canadian Border—Hundreds campsites, islands, farmlands directly from Tax Authorities (non-profit). Lists. Photographs mailed; Bureau, 282 Davunport, Toronto 5, Canada.

FLORIDA—Big, Beautifully Wooded Tracts on Prominent Highway in Famous Green Hills Pleasure Resort Area 28 miles North Panama City. Also choice 1/4 Acre Lakeside Homesites. \$10 Monthly. Free Maps, Photos. Owen A. Wood, Dept. PS, Fountain, Florida. AD 62005 (K) (O).

CAROLINA Coast homesites in Beautiful Boiling Spring Lakes! High, dry, pine wooded 70x150 lots—\$10 down, \$10 month. Good roads. 50 freshwater lakes. Excellent fishing, hunting. Championship golf course ready for play. Resort motel open year round. Satisfaction guaranteed. Free literature. Boiling Spring Lakes, Southport 2-F, North Carolina.

20 TREES, SHRUBS, ROOTS, HERBS

GINSENG bringing \$14 pound. Have seeds, plants. Goldenseal. Full information. G. Collins, Viola, Iowa.

22 PROFITABLE OCCUPATIONS

INVESTIGATE Accidents. Earn \$750 to \$1,000 monthly. Men urgently needed. Car furnished; business expenses paid. No selling. No college education necessary. Pick own job location. Investigate full time. Or earn \$8.44 hour spare time. Write for Free Book. No obligation. Universal, CPS-5, 6801 Hillcrest, Dallas 5, Texas.

VENDING Machines—No Selling. Operate A Route of Coin Machines and Earn Amazing Profits. 32-Page Catalog Free. Parkway Machine Corporation, 715PSP Ensor Street, Baltimore 2, Maryland.

EARN Money raising fishworms for us! Write: Oakhaven-7, Cedar Hill, Texas.

CHROME Plating, Instructions, Equipment and Supplies. Platers' Supply, P. O. Box 565, Lugo Station, Los Angeles, Calif.

FREE Literature—Make Big Money Raising Fishworms and Crickets. Carter Farm-10, Plains, Ga.

INVESTIGATE Auto Accidents—Pays up to \$750-1,000 a month. Investigators needed everywhere, part or full time. Car furnished; expenses paid. No selling. Meet interesting people. We train you spare time at home in weeks. Hold present job until ready to switch, or start own investigating business. Free information. No obligation. Liberty School, Dept. C-25, 1139 West Park, Libertyville, Illinois.

BARGAINS! Buy wholesale! Save money! Free catalog! Norris, 273-CQ Merrick Road, Lynbrook, N. Y.

LEARN LP-Gas Carburetion. Big new field! Servicemen needed for tractors, trucks, forklifts. Work spare-time, full-time, rural or city. Free information: J&S Carburetor Co., P.O. Box 10391-T, Dallas 7, Texas.

BECOME independent with your own franchise business. Thousands earning handsome incomes. Request interesting facts today. National Franchise Reports, Y-528, 333 North Michigan, Chicago 1.

RAISE Fishworms! Make Big Money Now! Free information. California Bait Company, Fair Oaks 64, California.

EARN easy extra money, no selling. \$100.00 to \$200.00 weekly. Send \$1.00, complete information. Locke's, 90 Harrington Ave., West Concord, Mass.

SHARPEN—Scissors, pinkers, clippers. Inexpensive, capable machines. . . . Blackhawk, Sheldahl, Iowa.

SPEEDOMETERS—best paying specialty in automotive field. Full or part time work everywhere. No shop necessary. For complete instruction manual write Auto-Instrument Company, 711 Magnolia Avenue, Orlando, Fla.

AUCTIONEERING—Resident and Home Study Courses. Diploma granted. Auction School, Ft. Smith, Ark.

BAKE New Greaseless Doughnuts in kitchen. Half profit. Sell stores. Free recipes. Stephen, 3605 15th, Minneapolis 7, Minnesota.

23 BOOKS & MAGAZINES

"PROPHET Elijah Coming Before Christ" Wonderful Book Free. 58 Megiddo Mission, Rochester 19, New York.

NATIONAL Geographic Magazines. Any issue, 1888-1960. Periodical Service, Box 465-PS, Wilmington, Delaware.

FREE—Freethought book list and sample Rationalist magazine "The Liberal." Friendship Liberal League, Inc., Thomas Paine Center, Box S, 5233 N. 5th St., Phila. 20, Pa.

BRITISH Book Bargains. Any subjects. Catalogue free. Transanbooks, Wantagh, New York.

ATHEIST Books. Catalogue free. Truth Seeker Co., 38 Park Row, New York 8.

BOOKS! Elusive. Located! Free Lists. Mel. 12725 Flatbush, Norwalk, California.

FREE catalog of illustrated books on costume, corsets, boots, etc. Naboma, Box 20725, Los Angeles 6, California.

BOOKS located! Mystery, Science-Fiction Bookfinders, Box 668-PS, San Diego 12, Calif.

SAVE TO 83% on Books, Records. Free Catalogue. Discount Reader's Service, SEC-5435 Upland Way, Philadelphia 31.

THE Time of Our Lives! It's fascinating. Only \$1. Crib Books, Michigan City, Ind.

BOOKS! 7 For \$1.00. All Subjects. Catalogs 15c. Myers Books, Marquand, Mo.

BIG Blue Books. Catalogs Free. United Book Service, Box 53, Wilmington, California.

BOOKFINDING Our Specialty. Try Us. Babcock, 412 Lulu, Wichita 11, Kansas.

BOOKHUNTERS! Scarce, Miscellaneous Books Supplied! Atlantic Book Service, 10 Cedar, Charlestown 29, Mass.

24 HYPNOTISM

FREE Hypnotism, Self-Hypnosis, Sleep-learning Catalog! Records, Tapes, Books, Courses, Equipment! Drawer PS400, Ruidoso, New Mexico.

HYPNOTIZE Self, Others while asleep with amazing hypnotic phonograph records, tapes. Catalog free. Research Association, Box 24-G, Olympia, Washington.

FREE Illustrated Hypnotism. Selfhypnosis Catalogue. Write: Hypnotist, 8721 Sunset, Hollywood 69P, California.

HYPNOTIZE Unnoticed, quickly, effortlessly, or refund! Thousands delighted! \$2. Intern, Box 244, Cedarburg, Wisconsin.

WORLD'S largest catalog free. Merlin Enterprises, P.O. Box 613, Los Catos, Calif.

HYPNOTIZE unnoticed! Patented new hand device makes you a Hypnotist first day or refund! Hypnotist's Handbook included! \$2. Hypnosis Foundation, Box 487, La Mesa 2, California.

HYPNOTIC Aids. World's Largest Illustrated Catalogue 10c. Stowell's, Woodstock, New York.

HYPNO-COIN has fascinating, eye arresting motion. Complete with revealing secrets, instructions and free illustrated catalog. \$1.00 ppd. Guaranteed. Hypnotic Aids, Dept. A-95, 1133 Broadway, N.Y.C. 10.

"LATEST Hypnotism Methods!" Immediately! Manual includes "Self-Hypnosis!" \$2.00 postpaid. Brugenheimer Company, Box 201-7, Lexington, Massachusetts.

HYPNOTISM! Conquers! Cures! Free illustrated catalog. Psychologist, Box 67, Lemon Grove 2, California.

HYPNOTIZE Successfully In Three Hours! "Instantaneous," "One Word," "Against Will," Methods Exposed! Complete Illustrated Course Plus "Secret Nerve Pressure Technique," "Getting Willing, Cooperative Subjects Easily," "Chevreul's Pendulum," "Two Hypnotisms," "Sleep-Learning" Information. \$2.00. Results Guaranteed! Arthur Fowler, Box 4391, Woodbury, New Jersey.

HYPNOTISM. Selfhypnosis. Guaranteed home study courses. Diploma awarded. Free particulars. School Hypnology, East Meadow 1, New York.

FREE Hypnosis—Sleep Learning Catalog. Fletcher, 2407-P.S. Catherine, Dallas 11, Texas.

POPULAR SCIENCE OPPORTUNITIES

SELF-hypnosis may help you many ways. Dynamic new concept of learning quickly, easily! Book! Tape! Record! Free literature. McKinley Publishers, Audio Dept., Box 3038, San Bernardino, California.

HYPNOTIZE Others—Unnoticed. Quietly. Quickly. Safely. Sure-Easy Instructions \$1.00. Rorick's, Cincinnati 26, Ohio.

HYPNOTISM—Little known method. Free information. Dr. Azadian, Fowler, California.

HYPNOTISM Classes in Los Angeles. Write: Hypnotism Center, 3502 W. Century Blvd., Inglewood, California.

25 MAGIC TRICKS, PUZZLES, ETC.

BE A Magician! Introductory Catalog with Free Trick, only 35c. Ireland, 109-T North Dearborn, Chicago 2.

WORLD'S finest professional magic Joker novelties. Giant illustrated catalog 10c. Top Hat, Evanston 13, Illinois.

VENTRILOQUISM! Information Free! Dummy Catalog 25c. State age. Maher, Box 36-B, Kensington Station, Detroit 24, Michigan.

1000 WAYS to have fun with Professional Magic, Tricks, Jokes, Puzzles! World's Greatest Catalog! 160 Pages! 800 Illustrations! Amazing! Exciting! Brand new! Yours for Dime. House of 1000 Mysteries, Dept. PS5C-63, Monroe, Connecticut.

FASTEST same-day service to magicians everywhere for 40 years. Send 10c for Douglas famous Catalog 500 Tricks, containing magic for pocket, parlor, club, stage. Douglas Magicland, Dept. 22, Dallas, Texas.

CATALOG, Free Trick, 15c. Poules Magic, 437 Brittain, Akron 5, Ohio.

WORLD'S Finest Magic Catalog, \$2.50. (\$2.00 magic included free). 3000 Tricks, Pocket, Stage, (408 pages). Kanter's, S-200 South 13th, Philadelphia 7.

26 COINS & CURRENCY

25 DIFFERENT coins from 25 foreign countries. \$1.00 bargain. Hindley, Box 708, Aurora, Illinois.

GIANT Illustrated Catalog listing Hundreds of Bargains in Coins and Supplies, only 50c. Barco, 31-A North Clark, Chicago 2.

BARGAIN List! U.C. Coins, Accessories. Stamp please. Hugh's, Hickory, N. C.

LINCOLN Cents From San Francisco. Ten different dates (Our Choice). For 25c with coin approvals. Molzan, Box 275, Alameda, California.

THREE different Indian Cents. Album. Bargain Catalog. \$1.00. Hobby Sales, St. Paul 16, Minn.

TRUNKFUL 25,000 Indian-Lincoln cents mixed (from the 1920's & older). Will pack "Grab-Bag" style. 400 mixed—\$25. Sample bag of 20—\$2. Mrs. Fischer, Box 6490, Sherman Oaks 35, Calif.

COIN Magazine, 200 pages. Sample 50c. Numismatic, 7320 Milwaukee, Chicago 31.

FREE Coin Supplies. Giant Coin list 10c (refundable). Economy Sales, Mansfield, Massachusetts.

COIN Bargains Galore! Illustrated Lists, 10c (Refundable). Hutchinson's, Box 6256, Philadelphia 36, Penna.

40 PAGE illustrated United States and Canadian coin list 10c. Stony, 260 Washington, Boston 8, Mass.

BARGAINS—Brilliant Uncirculated Dollars: 1898-O—\$4.50, 1899-O, 1900-O, 1901-O, 1902-O each \$1.95, 1903-O—\$39.50, 1904-O—\$3.75. All seven \$49.50. Retail Guidebooks—"Redbook" \$1.75, Canadian \$1.25, World's Coinage \$4.25; Premium "Bluebook" \$1.00. Bargain Lists 25c. Bebee's, 4514 North 30th, Omaha 11, Nebraska.

ILLUSTRATED Coin Catalog—\$1.00 Postpaid. American, Box 663, Kansas City 38, Missouri.

2 MEXICAN Silver Dollars \$1.00. 100 Foreign Coins \$2.95. Browns, Box 188S, Tolleson, Arizona.

UNCIRCULATED 1935 Silver Pony Express Commemorative Medal \$1.00. Coin Lists Free. Sayers, 1000 Unaka, Johnson City, Tennessee.

INDIAN Cent, Assorted "S" Mints. Folder, \$2.00. Denman, Box 577, Santa Clara, Calif.

TOPS! Free illustrated booklet "How To Collect Coins." Approvals. Littleton Coin Co., Littleton E2, N. H.

1955-S CENTS Uncirculated \$1.00 Each. Two Circulated \$1.00. Stroud's Coins, Kinston, N. C.

BUYING 1950-D Jefferson Nickels. Paying \$4.50 each. Buying Lists 20c. William Styba, Winona, Minn.

LINCOLNS! 25 Different Before 1931—\$1.50. Reighard's, R.D. #1, Steubenville, Ohio.

INDIANHEAD Cent With Terrific Bargain List 35c. Fairway, 121-P, Rye, N. Y.

LINCOLNS: 40 Different 1909-41 plus 1960D small date \$1.95. 24 different "S" (including rare 1955S) \$1.50. Harris, 9011J Presidio, San Francisco 29, California.

12 DIFFERENT Lincolns before 1921 \$1.00. 24 Before 1931 \$1.50. Gene Carlton, Box 88-PS, Chandler, Okla.

WOW! "Rare" Silver Dollars! Brilliant! Uncirculated! Low Prices! 1903-O only \$40.00! 1898-O—\$2.50! 1899-O—\$2.00! 1900-O—\$2.00! 1901-O—\$3.00! 1902-O—\$2.00! 1904-O—\$2.00! Thousands of other Coins! Rush your order and get our Free Price List! Silver Center, Box 3293-S, San Francisco 19, California.

1878 CARSON City Dollar Uncirculated \$5.00. Coin Catalogue 50c. Shultz, Salt Lake City 10, Utah.

TESTING Solution For Silver Coins! Instructions! Avoid Counterfeits! \$1. Nelson, 346-P, Rye, N. Y.

COIN collectors! Learn what your coins are really worth. Send 25c for sample or \$3.00 for next 12 big issues. Coins Magazine, Coin Street, Iola, Wisc.

TWENTY-four page 1963 retail price list of U.S.A. and Canadian coins, 10c. Our selling prices on thousands of coins and coin collectors supplies. Bryson Incorporated, 612B White, Toledo 5, Ohio.

NUMISMATIC News tells today's value of all coins. A Great Newspaper. 26 issues a year full of reliable coin news. Sample 25c. \$3.00 yearly. Dollar Street, Iola, Wisc.

ANY five Jeffersons except 38SD, 39SD, 50D, 51S, 55P, \$1.10. Tracy, 25 Quinlan, Staten Island 14, New York.

28 STAMP COLLECTING

EXCEPTIONAL 125 different, cataloging \$3.00. Includes triangles, commemoratives, 10c approvals. Reeves, Box 37597P, Miami 37, Florida.

225 STAMPS For only 10c! This mammoth value includes Airmails, Pictorials; stamps from strange Countries cataloging up to 25c each! Also Approvals. Mystic Stamp Company, Camden 55, N. Y.

UNITED Nations. 15th Anniversary Sheet. With first day cancel, as commemorated by Russia. Free! While they last, with approvals. Philatelics, P-J, New Paltz, N. Y.

80 DIFF. U.S. Stamps. Includes 19th Century Commemorative. High values. Plus 1943 Flag Stamp of Occupied Nations. All for only 25c. Approvals included. Willett Co., Box 338-Y, Yorktown Heights, N. Y.

25 DIFFERENT Commemoratives 1893 up 10c. U. S. Approvals. K & B, Box 70, Brooklyn 23, N. Y.

U.S. Mint Specials! Flag Set Complete, \$1.00; 1c, 2c, 3c Famous Americans (21 different), \$1.00. Free list. Brooks, 2323 Avenue X, Brooklyn 35, New York.

UNITED States commemorative collection containing 33 different—10c. Approvals. White, 516-W Avenue L, Brooklyn 30, New York.

AMAZING Offer! 200 U.S. stamps—including commemoratives, airmails, high denominations to \$1.00—only 10c to Approval Applicants! Illustrated Bargain Lists free. Mystic Stamp Co., Dept. 55, Camden, New York.

NUDES set (4)—Unusual Approvals 10c. Atlas, Plainfield, Racine, Wisconsin.

702 U.S.A.—25c (plenty commemoratives. Request Approvals. Horace Gatewood, Winston-Salem, N. C.

21,000 ALL Different, only pennies a day using our systematic payment plan. Details Free. Sjoquist, 1435-A Cherrydale, San Jose 25, California.

ISRAELI New Year 5718. Issued for the Hebrew New Year 5718 (our 1957), a complete, multicolored stamp set with commemorative tabs. Free! While they last, with approvals. Philatelics, P-O, New Paltz, N. Y.

TOPICALS, 25 different, only 10c to approval applicants. Stamac, 108 Park Place East, North Charleston, South Carolina.

200 DIFFERENT Stamps, 25c with approvals. Smith, 508U Brooks, College Station, Texas.

U.S. STAMPS, Giant Discount Catalog—25c. Raymax, 37-VX Maiden Lane, N.Y.C. 38.

FREE—Mammoth Collection, including \$10,000 Airmail, World's smallest Stamp, gorgeous multi-color pictorials plus Scott's International, Master Global Albums, Scott's 1963 Catalogues, all Free when you buy Foreign approvals. Bargain Stamps, Box 1112B, Miami Beach 39, Florida.

OVER \$20.00 value for \$1.00. 1,000 Different Worldwide. Approvals included. Adults Only. Universal, Box 6, Kenosha 6, Wisconsin.

50 YEARS Old—15 different United States Stamps at least 50 years old—10c with low priced United States approvals. Jaxon, Box 145 S, Brooklyn 30, N. Y.

FREE! Giant Bargain Catalog—New Edition listing thousands of bargains including U.S. and B.N.A. Stamps, packets, mixtures, albums, accessories and supplies; sent with beautiful approvals. Jamestown Stamps, Dept. E53PS, Jamestown, N. Y.

FIFTEEN Pleasant Offers Plus Valuable Tips. Write: Bileski, Station B, Winnipeg, Canada.

DAG Hammarskjold "Error" 5c with approvals, Belmont Stamps, Washington 15, D. C.

FANTASTIC Fish Triangles!! Valuable "Ben Franklin" on Canal Zone!! Flaming bi-colored Volcano Triangle!! Lovely Olympics Triangle!! Plus Icy Greenland, Weird Wild Beast issue and others. 10c with approvals. Roseland Stamps, Spring Lake 10, Michigan.

HISTORY In The Making Issues! 65 different U.S. stamps, including Airmails, Special Delivery, Postage Dues, High Denominations, etc., some over 75 years old! Only 10c with approvals. Offer to adults only. Littleton Stamp Co., Littleton B2, N. H.

NO gimmicks—No Gadgets—No give aways. Just attractive approvals at attractive prices. Sunny Stamps, Apopka, 10B, Florida.

SMASHING Collection Free—Includes Triangles, Early United States, Rockets, Sports, British Colonies, High Value Pictorials, etc. Complete Collection plus big, Illustrated Magazine, all free. Send 10c for postage. Gray Stamp Co., Dept. PR, Toronto, Canada.

105 DIFFERENT U.S. Stamps 25c. Approvals included. Shelton, Box 187-P, Hempstead, N. Y.

327 WORLD WIDE Different 25c. Bargain approvals. Niagara Stamps, St. Catharines 202, Ontario.

103 DIVERSIFIED British Commonwealth 10c. Approvals included. Crown Stamps, Virgil 602, Ontario.

DIAMOND Roosevelt, Pope, Triangle, Greenland, Angola, 51 others 5c. Approvals. Longhorn, Box 3068P, Lubbock, Tex.

25 LARGE American Commemoratives 10c. Accompanying approvals. Free perforation gauge. Linstamps, St. Catharines 102, Ontario.

FREE Macao Mint Set, Approvals. Corvett, GPO Box 1546, N.Y. 1.

FLAG Stamp Free with U.S. Approvals. Gorlitz, Box 265, Park Ridge, Ill.

FREE Sample! Interesting, Informative, Illustrated. National Stamp News, Anderson, South Carolina.

TRADE Your Duplicates. (Toward Foreign Approvals). Write: VST, Box 98-S, Newton Highlands 61, Mass.

GIANT Approvals Thousands Different 1c and 2c each. Wahl's Stamp Exchange, 7008K Farragut, Chicago 31, Ill.

60 DIFFERENT U.S. (30 Commemoratives) 25c. No approvals. Seidenberg, Appleton, Wis.

POPULAR SCIENCE OPPORTUNITIES.

FREE! 222 Worldwide. 10c handling. Penny Approvals. Jung, Box 46277, Los Angeles 46.

SUPERB Approvals. Stamps $\frac{1}{2}$ to $\frac{1}{4}$ catalog. P. G. Beals, 62 Bridge St., Manchester, Mass.

1000 DIFFERENT \$1.00 with approvals. Goldens, 6721 Eastwood, Philadelphia 49, Penna.

SURPRISE Collection. Exotic mint British Colonials absolutely free with approvals. Viking, Great Neck 5, N. Y.

105 DIFFERENT U.S. Stamps 25c. Approvals included. Shelton, Box 187-P, Hempstead, N. Y.

PRICE List Foreign Older Issues. Thomas, 5000 Miami, St. Louis 9, Missouri.

SUPERLATIVE Worldwide Topical Collection, 10c! Bonuses. Approvals. Baker, Thomaston 1-M, Connecticut.

FOREIGN Mixture Free. Price List, Approvals accompany. Buchwald, Box 536, Church, N. Y. 8.

PHILIPPINES Commemoratives (Republic). 15 different for only 10c to approval applicants. Capital Stamps, Ferrysburg 10E, Michigan.

15 ISRAEL 5c. Approvals accompany. Cooper, Box 75053, Los Angeles 5, California.

MALDIVES Fish Triangle, Butterfly Triangle, Scout Beauty, 25 others, 5c. Approvals. Cross, 2665 Luna, San Diego 17, California.

65 DIFFERENT U.S. Commemoratives 15c. Approvals. Gordon Davison, Henninger 5, N. H.

EIGHT Rainbow Colored Flag Stamps 5c. Approvals. Dimeo's Stamps, 616 North Adams, Havre de Grace, Maryland.

TRIANGLES—African Beetle set 5c with approvals. Dunn, Floyd, Virginia.

500 WORLD Mixture. Big Value 30c. Monjar, Fairmount, Cincinnati 14, Ohio.

TWO Hundred Different Stamps 25c. No Approvals. Norge, Hohokus, N. J.

REAL Old U.S. Seconds, Bargain Prices. G. Swartz, Malden Bridge, New York.

WHITE Ace—World's Finest Stamp and Cover Albums—Send for Folder. The Washington Press, Maplewood, N. J.

FREE Stamps with approvals. Kanmar 2568—83 Street, Jackson Heights, N. Y.

HAMMARSKJOLD Error of Inverted background (originally quoted \$5000), plus normal stamp for comparison. Both Mint stamps plus another Error used in mailing—Everything 10c! Stamp Dictionary and Approvals included. Stampex, Box 47-MP, White Plains, N. Y.

FREE! 29 thrilling jet, astronaut rocket, space, airmails. Send 10c handling. 2c approvals included. ABC World, Box 6000-WK, San Francisco, California.

240 DIFFERENT World Wide Only 10c To Approval Applicants. Winchester Stamps, 45 Winchester Rd., Mansfield, Ohio.

JOB Lot Approvals. Postpaid Both Ways! Box 631, Wichita, Kansas.

80,000 DIFFERENT! Amazing new plan builds your collection systematically, country by country. Only 50c weekly. Free details. Ware, Monroe 70, Conn.

200 MIXED U.S. 15c. Approvals. D&L Stamp Co., 2042 Bancroft, Youngstown, Ohio.

VATICAN Mercies Airmails 10c. Approvals. Snedco, Box 68A, Waldwick, N. J.

50 DIFFERENT Central and South America, 10c with world-wide approvals. Cole, Box 223-G, Buffalo 21, N. Y.

100 OLD U.S. Stamps between 1861 and 1935 \$1.00. Rousch Stamps, 51 Chestnut, Mansfield, Ohio.

ECONOMICAL $\frac{1}{2}$ -3c Approvals, 39,000 varieties. Dresel, Box 628-T, West Englewood, New Jersey.

95,000 DIFFERENT! Pennies A Day Builds Collection Methodically. Free Particulars. Holtzman, 95-S Terrace, Levittown, Pennsylvania.

ENORMOUS variety old U.S. flags, famous Americans, Commemoratives with approvals, surprise packet, 10c handling. Metropolitan Stamps, Box 312 PS, Jackson Heights 72, N. Y.

FREE! 25 Egypt, 10c handling. Approvals. Bellet Stamps, Hazel Park, Michigan.

MILLION Foreign Stamps! 2c each! Send for thrilling, giant approvals! ABC, Box 6000-ML, San Francisco 1, California.

WORLDWIDE, 50 all different, absolutely free, just to introduce our incomparable approvals. Kent Stamp Company, G.P.O. Box 87, Brooklyn, N. Y.

SENSATIONAL Penny Approvals! Pictorials, Topicals, Etc. Write Today! Schmidt, Box 5426, Reno, Nevada.

PORTUGUESE! 25 Different free. Approvals. Elkhart, Box 33, Elkhart, Indiana.

100 DIFFERENT Stamps 10c, with approvals. J. Nutt, Box 357, Penn Yan 1, N. Y.

LOOK! Six Queen Elizabeth Mint Sets from Antigua, Caymans, Malta, Montserrat, Mauritius, St. Kitts! 21 Brilliant Pictorials 25c. Attractive Approvals! Gannon Stamps, Box 931, Canton 1, Ohio.

EXTRAORDINARY! Free; 20 different Finland to those requesting approvals. Rizenberg, Box 1303, Chicago 90.

COLORFUL Pictorials from 25 different countries, includes triangles, etc. 10c with approvals. West Coast Stamp Emporium, P.O. Box 3042, North Hollywood, Calif.

EXCHANGE. Send 100-200 different foreign with 20c. Receive different. Patterson, Lancaster 12, New York.

117 DIFFERENT; Monaco "Chevy," Fairy Tales, African Triangles, British Colonies, 10c. Approvals. Catalinas Stamps, Orange, California.

SERIOUS Collectors—Future Rarity 5c Washington Booklet Pane issued for FDC use—Never Stapled—Mint \$2.00. Silver, 251-26 58 Avenue, Little Neck 62, N. Y.

VATICAN'S—25 Different \$1.00. Approvals. Royal Stamp Company, Tamaqua, Penna.

200 DIFFERENT Germany 10c. Approvals. Rothschild, 3112—76th Ave., Washington 28, D. C.

LAOS! 25 Different \$1.00. Collections by Countries. Price List Free. George Richie, 1539 Sixth, Alameda, California.

FOREIGN Sets Mint—Used. Service Charge 10c. Peterson, Box 31, St. Paul 2, Minn.

PENNY Approvals! Regardless Catalogue! Kloster, 4164—52nd Ct., San Diego 5, California.

NEW ZEALAND, 20 different including giant Christmas and centennials. 10c. Approvals. Reinhardt's, Box 93ES, Troy, Michigan.

U.S. BARGAIN: 50 different 10c with beautiful world-wide approvals. Stamps, Kennebunk, Maine.

APPROVALS For Beginners And Advanced Collectors. Large Selection Of U.S. And Foreign Mint And Used In Large And Small Approval Books. We Specialize In U.S. And British. Low Prices, High Quality. Want Lists Filled. 35 Years In Business. Plymouth Specialty Co., P.O. Box 510, Bell, Calif.

29 ANTIQUES, RELICS & INDIAN GOODS

SPEARHEAD. Bone Awl, Birdpoint \$2.00. Hatchethead, Gem Scraper, Perforator, Scaler \$2.00. Gem And Jasper Arrowhead \$2.00. Axe \$4.00. Forty Beads \$2.00. Palmer, 435 Washington Road, McKeesport, Pa.

SELLING 20,000 Indian Relics, Arrowheads, Spearheads, Etc. List Free. Lear's, Glenwood, Arkansas.

30 MINERALS & PRECIOUS STONES

EARTH Science—Rockhounds National Magazine. Subscription \$2.50. Sample 35c. Box 1357-PS, Chicago (90), Ill.

ROCKHOUNDS—Gem Cutters—Jewelry Makers . . . new Free catalog—just off the press! Biggest supplier to hobbyists and craftsmen offers you tools, materials, equipment, introductory bargains and know-how. Free catalog . . . Write Grieger's, Dept. C-13, 1633 E. Walnut, Pasadena, California.

GOLD, Copper, Titanium Ore With Catalog 50c. Gemco, Elsner Ave., Sheboygan, Wisc.

31 HOBBIES, COLLECTIONS

SOLDIERS—Over 1,000 models. All periods. Catalog 35c. Bussler, Box 107-E, Wollaston 70, Mass.

INTRODUCTORY: 30 Army, Navy, Marine emblems; 150 assorted Service Stripes (\$5.00 value) only 50c, catalog included. Sample foreign medal, 50c. Insignias, Box 71-S, Rockaway 94, N. Y.

HOW To Collect Postage Meter Stampings, and Flying Eagle Handbook. Illustrated. First book published on subject. \$4.00 copy postpaid. Order from author. H. Harsh, Hollywood, Maryland.

COLLECTORS Matchbook Covers! 100 Different Unused \$1.00. Catalog 25c. Helene S. Edelman, 1311-P East 84, Cleveland 3, Ohio.

WANTED. Cigarette, tobacco cards. Write: Charles Bray, East Bangor, Penna.

LEAD Soldiers—All the world's armies. Unpainted 12c to 30c each. Catalogue 50c. Jack Scruby, 2044 South Linwood, Visalia, California.

HOBBY Magazine With Interesting Articles And Hobby Listings, 25c. Write: Hobby Mail Trade, Box 134, Clifton 8, N. J.

32 PHOTO FINISHING, PHOTOCOPIES, ETC.

FAST, Hi-quality Finishing—Kodacolor Rolls: Eight Jumbo Prints \$1.98—Twelve \$2.49—Twenty \$3.49—Reprints 15c. Also low B&W Prices. Custom Quality Studio, Box 4838A, Chicago 80.

COLOR Movie Fans! Low Cost—High Quality processing our specialty, 8mm just \$1 (or \$3 with fresh film). Mailed back next day. Craftsmanship guaranteed. Send exposed reel or request free mailers and price list of complete photo-finishing services. Direct Mail Photo, Box 8352-PS, Pittsburgh 18, Pa.

FAST Service! 12 Exposure Roll Jumbo Prints 70c, Wallets 25 for \$1.00, 5x7 enlargement 30c. Mail-In Photo, Box 707, Lowell, Mass.

33 MOTION PICTURES & COLOR SLIDES

8MM, 16MM MOVIE Subjects—silent, sound—new, used—2"x2" color slides—biggest selection anywhere! Free, each month, big 24-page newspaper-size catalog. Blackhawk Films, Davenport 15, Iowa.

MOVIE Film! Free catalog! Eso-H, 47th Holly, Kansas City 12, Mo.

SAVE! Process your own movies at home. Free Catalog. Superior, 442-448 N. Wells, Chicago 10.

FREE Catalogues. 5,000 8-16MM Films. International-S Films, Greenvale, New York.

LADY Wrestling. Movies, Photos. Free List. Peerless, Box 171-P, New York 13, N. Y.

8MM SILENT Films. 16MM Sound Films. Bedner, 5300 So. Talman, Chicago.

SEE the World in Color. 8mm—16mm. Kodachrome Movies. Alaska, Hawaii, Europe, Africa, U.S. National Parks, Disneyland, War and Rocket Films. 185 Subjects. Write World In Color, Box 392-PS, Elmira, N. Y.

16mm SOUND Rentals And Sales. Hutton Rental Service, Bellows Falls, Vermont.

16mm SOUND-Projectors, Films, New, Used for Sale. Free Catalog. National Cinema, 71 Dey Street, New York City N. Y.

34 CAMERAS, PHOTO SUPPLIES

FREE! Send now for photographic bargain book. Dept. 4-K-5, Central Camera Company, 230 So. Wabash Ave., Chicago, Illinois.

35 MUSICAL INSTRUMENTS AND SONG WRITERS

ACCORDIONS, Guitars, Chord Organs! Save $\frac{1}{2}$. Famous makes. Free home trial. Easy terms. Trades. Free catalogs. Mention instrument. International Music Mart, Dept. P, 2003 Chicago Avenue, Chicago 22.

ACCORDION-O-RAMA, 874 Broadway, New York 3, N. Y. Tremendous Discounts. Top Brands. Free Brochure.

SONGWRITERS, with publisher con- tacts, want song ideas. Share royalties. Send poems, free examination: Songwriters' Associates, 1650 Broadway, N. Y. 19-G.

POPULAR SCIENCE OPPORTUNITIES

SONGPOEMS and songs wanted! Mail to: Tin Pan Alley, Inc., Box 405, Radio City Station, New York 19, N. Y.

SONGS Into \$\$\$\$\$\$—Share \$33 million dollars yearly for New Songwriters, Song-poets. Any subject, songs composed, published, promoted by largest firm. Information, appraisals Free. Send Nordyke Music Publishers, 6000 Sunset, Hollywood 28PS, California.

POEMS Wanted for musical setting and recording. Send poems. Free examination. Crown Music Company, 49-P West 32 Street, New York 1.

SONGWRITERS! Protect your ideas! Hold all poems, songs! Write for safe, correct procedure! Song Service, Dept. PS, 333 W. 56th, New York 19, N. Y.

ACCORDION—Organs! Buy Direct! Big Savings! Free Catalog, Terms. Accordion Import Center, 7120 Galli Dr., San Jose 29, Calif.

POEMS Wanted for musical Setting, Recording and Promotion. On Royalty Basis. Any Subject. Send Poems: Nashville Music Institute, Box 532-S, Nashville, Tennessee.

USED Professional Guitars, Amplifiers, Drums, Catalog 10c. Music, 1215 War Memorial, Peoria, Illinois.

PLAY Guitar—"Teach Yourself" 78 Lesson Book, \$3.00. Hendrickson Publications, Studio PS, Box 5024, Borger, Texas.

PIANO Accordions—7600-J Cottage Grove, Chicago 19, Illinois. Chromatics—Hohners—Concertinas—Wholesale.

GUITAR Making, books, plans, imported woods, tools. List 10c. Wildwood, 510 East 11th Street, New York 9, N. Y.

BANJOS, Parts, Rings, Necks, Hardware, 263A E. Forhan, Long Beach 5, Calif.

ELECTRIC Guitars, amplifiers, wholesale. Free catalog. Carvin, PSM, Covina, California.

MUSICAL Instrument Catalog \$3.00, refunded. Only such catalog found anywhere. Enclose check: Dahlstrom Piano and Supply, Thief River Falls, Minnesota.

35A PHONOGRAPH RECORDS

RECORDS—Stereo, Monaural. Big Discounts. Noelsson, Box 211, New York 5, N. Y.

36 RADIO, TELEVISION, ELECTRONICS, HI-FI

SAVE 30% Up! Blank-Stereo Recorded Tape—Recorders—Norelco Speakers. Saxitone, 1776 Columbia Road, Washington 9, D. C.

SAVE dollars on radio, TV-tubes, parts at less than manufacturer's cost. 100% guaranteed! No rebrands, pulls. Request Bargain Bulletin. United Radio, 1000-S, Newark, N. J.

FIX Your Own TV. Save 80%! Send for Free Illustrated Chart showing how! We'll include Giant Electronics Catalog. Zalytron, 461 Jericho Tpke., Mineola, N. Y.

ELECTRONICS Course only \$14.95. Includes all tubes, parts, tools, instructions. Write for full information. Edu-Kits, Dept. 581A, Hewlett, N. Y.

ASTOUNDING Government surplus illustrated catalog 10c. Meshna, Lynn, Mass.

TRANSISTOR Radios Repaired. \$5.00 covers parts, labor, return postage. Mail radio and \$5.00 to: Mannington TV Co., 23 Pyles Ave., Mannington, West Va. Guaranteed. Short-Wave \$10.00.

ALBEN Barkley Final Speech Record. 27 Minutes, \$3. Denker Enterprises, Box 33, Paducah, Ky.

NEW Plug In Device Spreads Shrinking T.V. Picture. Send \$3.00 To Rockland Television, 7 Veterans Parkway, Pearl River, New York.

37 BUSINESS OPPORTUNITIES

MURAL Artists Needed! No experience required, earn \$10-\$15 per hour! Amazing "Project-A-Mural" Method. Project pattern slides, trace-off, paint per color guide. Professional results guaranteed! Huge demand from homes, bars, restaurants, offices, etc. Sell \$100 murals for "pennies" in paint. Free Success Plan. Associated Muralists, Dept. F5C, 135 Vesta, Reno, Nevada.

SELL Champion, AC, Autolite spark plugs. Reconditioned, electroplated, guaranteed 10,000 miles. 100% profit. Free sample. Lee Plugs, 1608-K Roberts, Houston 3, Texas.

EARN Money raising fishworms for us! Write: Oakhaven-42, Cedar Hill, Texas.

\$100.00 WEEKLY spare room. Raise redworms odorless, soilless way. Charlie Morgan, Box 116-C, Bushnell, Florida.

OPERATE profitable mail order business. Write Walter Service, 4159-B East 112th, Cleveland 5, Ohio.

BRONZE Baby Shoes. Genuine Electroplating process. Equipment, Mountings, Instructions. Send \$1.00 for Valuable Book "Your Guide To Success" Bronzing Baby Shoes, plus complete catalog. Hollywood Bronze Supply, Dept. B70, 3445 Union Pacific Avenue, Los Angeles 23, California.

BUY Direct From Factories—Appliances, Cameras, Watches! Free details! Cam Company, 436PS Bloomfield Ave., Verona, N. J.

WANT Your name with 1000 mailers? 25c lists your name with out mailings every month. Dixie Mailers, King, N. C.

IMMEDIATE Profits with no capital or experience. Take orders for all magazine subscriptions. Friends and neighbors are your prospects. Write now for complete free kit. McGregor Magazine Agency, Dept. DB3, Mount Morris, Illinois.

STOP Throwing Away Boxtops! They're worth money! Some, 25c! Inquire: "Box-tops-DG", Cedar Hill, Texas.

VENDING Machines—No Selling. Operate A Route of Coin Machines And Earn Amazing Profits. 32-Page Catalog Free. Parkway Machine Corporation, 715 PSB Ensor Street, Baltimore 2, Maryland.

FREE Literature — Make Big Money Raising Fishworms and Crickets. Carter Farm, Plains, Georgia.

DOLLS! Dolls! Dolls! We teach you to repair, make, sell all kinds of dolls and accessories including clothing. Study at home. Earn while you learn. Free booklet. Lifetime Career Schools, Studio PSC-53, 11824 San Vicente Blvd., Los Angeles 49, California.

FREE: "How To Win Contests." International, Box 63-A, Bellwood, Illinois.

MAKE \$25-\$50 week clipping newspaper items for publishers. Some clippings worth \$5.00 each. Particulars free. National, 81, Knickerbocker Station, New York.

MANAGE Motel or Resort. Men, women, couples can make \$400.00 to \$1,000.00 monthly plus apartment. Pick own location with our employment assistance. Learn at home. Free Booklet. Motel Managers Training School, Dept. PSC-53, 612 So. Serrano, Los Angeles 5, Calif.

EXPORT—Import Business Made Easy. Complete setup service, not just instructions. Hermes, 152 West 42, New York City 36.

SELL Advertising Book Matches. Write us today; we put you in business By Return Mail, handling complete line Ad Book Matches in demand by every business right in your town! No investment; everything furnished Free! Top commissions daily! Superior Match, Dept. PX563 7530 S. Greenwood, Chicago 19, Ill.

PIANO Tuning learned quickly at home. Tremendous field! Musical knowledge unnecessary. Information free. Empire School of Piano Tuning, Champaign, Illinois. (Founded 1935.)

WORK at home packaging merchandise. Very profitable. No selling. Everything supplied. Details free. HBE, 1148-S West Grand, Chicago 22.

INSTALL Burglar Alarm Systems. Big profit home business. Beginners start spare time, without mechanical experience or costly equipment. Free starter plan. Nasco, Dept. K695, 11071 Massachusetts, Los Angeles 25.

OPERATE Restaurant Or Diner. Free Booklet reveals profitable plan. Write Restaurant Business School, Dept. FC-53, 1920 Sunnyside Avenue, Chicago 40, Illinois.

76 MILLION prospects! Immediate profits! Sell Champion, AC, Autolite spark plugs. Precision reconditioned, silver-plated, guaranteed 10,000 miles. Up to 308% profit. Free samples-details. Indy 500 Spark Plug Co., 4620 Braeswood, Houston 35, Texas.

\$100 WEEKLY possible. Compile Mailing lists and address envelopes for advertisers. Home-spate time. Particulars free. National Service, 81, Knickerbocker Station, New York City.

AMAZING New Home Plastics Business! Up to \$10.00 hour if you qualify. Pleasant, easy. No Selling. Secrets revealed in Free Plan. NPC, Box 23321-LE, Los Angeles 23.

"HOW and Where to Obtain Capital." Reliable Service, Rome City, Indiana.

MAKE Durable building plastic easily. Waterproof, fireproof, economical. Bays Laboratory, Cedaredge 2, Colorado.

FREE "Franchise Profit Letter" tells how unique NFR service is helping thousands seeking profitable businesses. Write today. National Franchise Reports, PS-528, 333 North Michigan, Chicago 1.

BE Sharp—Do Sharpening—make money sharpening knives, scissors, saws, tools. Big profits. Treyco hollow grinding outfit \$34.95. Write for free book. Treyco Products, N. Tonawanda 1, N. Y.

AIR Impact Tool Repairing. Home Study Course. Easy. Profitable. Free Folder. Dept. PS5, Air Tool Repair Manual Co., P.O. Box 1031, Bloomfield, N. J.

SENSATIONAL Moneymaking Home Business! Buying merchandise U.S.—Abroad, selling friends, stores, mail-order. Plan reveals suppliers thousands bargains like 17J. Watches—\$2.87. Binoculars—25c. Nylons—14c. Rifles—\$3.17. Details Free. Harvey, Box 3860-DF, Thornton 29, Colorado.

YOUR Own Moneymaking Mailorder Business. Write: Mann, 266-PS, Hillsdale, New Jersey.

AMAZING Manufacturing Opportunity. Free list of manufacturing formulas. Presler Oil Company, Fostoria 17, Ohio.

WANT To Make Big Money At Home? \$10.00 profit in an hour possible with Invisible Mending. Make tears, holes disappear from clothing, fabrics. Steady year-round demand from cleaners, laundries, homes. Details Free. Fabricon, 1535 Howard, Chicago 26, Illinois.

"HOW-TO of Mailorder"—Techniques, Secrets, Laws, Regulations. Complete Manual—\$1.00 Dean's, Box 40-POP, Elberton, Georgia.

350,000 BARGAINS! Free Merchandise! Write: Goldmine, 240-PZ, Planetarium Station, New York City 24.

WORLD'S Largest wholesale supply. Buy from 679 American, European, Japanese wholesalers. Tailormade suites from Hong Kong. 123 dropship catalogs. Rockbottom prices. Free details. International Buyers, 216-PS2 Jackson, Chicago 6, Illinois.

FREE wholesale directory list—350,000 items. Dean's Box 40-PS, Elberton, Ga.

\$20-\$50 DAILY. At Home. Boys, Girls, 14-90. Easy, Interesting, Fascinating. Details \$1. Stapp Research, 5027 Elm, San Diego 2, Calif.

SELL Books by Mail. 400% Profit. Royal, Box 450-M, Cleveland 27, Ohio.

OPERATE Home mailorder business. Vosacek Printing, 4444-PS Ute, San Diego 17, Calif.

I MADE \$40,000.00 Year by Mailorder! Helped others make money! Start with \$10.00—Free Proof. Torrey, Box 3566-F, Oklahoma City 6, Oklahoma.

BIG profit! Learn to operate auto and iron salvage yard. Box 806, Mason City, Iowa.

PLASTERCRAFT molds, liquid rubber, plasters, flocks, candle supplies. Catalog and manual free. Jayhawk Plasters, Blue Rapids, Kansas.

INCREASE Your Income! Mail Order Business Gives "Better Odds." Write: Mizee, Box 33014, Houston 33, Texas.

DEALERS! A New Plan-Of-Month is being featured. Write Mailorder, 529-PS, Riverdale Station, Dayton 5, Ohio.

HANDY With Tools? Your Own House Repair Business. High Income. Banish Unemployment Fears Forever. Amazingly Easy. Full Or Part Time. Free Information. House Doctor, 2809-P, Balasco, Fort Worth 7, Texas.

LOVE! Pays. Bronze Baby Shoes. Credit Available. Free Booklet. Box 5036C, Inglewood, California.

"READY-Made" Mailorder business available. Particulars free. Neil H. Tasker, Shamokin, Pennsylvania.

START Profitable Mail Order Business. Johnston, 3768-B Second, Detroit 1.

BUY Direct Or Mail-Order. Wholesale Catalogs European Supply Houses. Let Us Teach You The Mail-Order Business. Star Products, 111 So. Virgil Ave., Los Angeles 4, Calif.

PLASTERCRAFT. Molds, Liquid Rubber, Hobby Supplies. Sample and catalogue free. Wooley Company, 1915 B North, Peoria, Illinois.

ANYONE Can Learn Profitable Mail-order Business. Free Buying Guide Offer! Asche, 1608 Nelson, Chicago 13, Illinois.

LIQUID Molding Rubber. Free Information. Chaney's 5415-C San Jose Blvd., Jacksonville 7, Florida.

\$200.00 MONTHLY. Spare Time. With Tablesaw, Bandsaw or Jigsaw. Write. Holiday House, B3800 Harney, Vancouver, Washington.

"UNITED States Mailorder Laws And Regulations." Send \$2.00. Details Free. Carmac, 3320 East 44th Avenue, Vancouver, Canada.

WANT Good Paying Mailorder Business? Free Details! Davenport, Box 132-M, Inglewood, California.

BIG Profits. Handcrafted Jewelry Business. Free Details. LPS, Dept. 253, 1706 Argon, Mesa, Arizona.

\$3.00 HOUR Possible Home Sparetime Assembling Our Products. Novelty Lamps, Cabot 1, Arkansas.

MAKE \$46 From Square Foot Plywood; Jigsaw necessary. Free Details. Woodarts, Bridgewater, Mass.

\$70 WEEKLY—Home, spare time. Simplified mail bookkeeping. Immediate income—easy! Auditax, 34741D, Los Angeles 34.

VITAMIN Business. Complete. \$100.00. Terms. Inventory worth \$330.00. Owner, 2908-V Beverly, Los Angeles 57.

COLORGLAZED Concrete pottery made without molds. Patented method. Cemetery products, novelties, tiles. Basement leak-sealing. Money-making projects. Booklet, details free. Men only. National Potteries, Grand Rapids, "Minnesota."

BAKE New Greaseless Doughnuts In Kitchen. Sell stores. Free recipes. Summers, 3605 South 15th, Minneapolis 7, Minnesota.

37A INVESTMENTS

\$2,000,000.00 FUTURE Sales; Inventions Ready To Market. 1% Royalty Paid For Each \$100.00; Send Check. References: Wall St. Inventions, Investments, 210 5th Ave., (Suite B-106), New York 10.

38 MONEYMAKING OPPORTUNITIES

\$100 WEEKLY possible. Compile Mailing lists and address envelopes for advertisers. Home-spare time. Particulars free. National Service, 81, Knickerbocker Station, New York City.

MAKE Plastic novelties for extra income. Low cost home training now available. Write for free booklet. Interstate Training Service, Dept. D-2, Portland 12, Oregon.

VENDING Machine—No Selling. Operate A Route of Coin Machines And Earn Amazing Profits. 32-Page Catalog Free. Parkway Machine Corporation, 715 PSM Ensor Street, Baltimore 2, Maryland.

TO \$100.00 Weekly. Mailing Catalogs. Sample, instructions, 25c. Costar, GPO Box 972-PS, New York 1.

EASY to start rubber stamp business at home in spare time. Make up to \$9.80 an hour without experience. Facts free. Write to Roberts, 1512 Jarvis, Room CR-3-D, Chicago 26.

WE Love our mailman. Leaves \$1,000.00 monthly in our rural mailbox. My college professor husband's scientific mailorder pays. We bought a Texas ranch, live as we always wanted. Free folder on "Ranch Mailorder." Eveningshade Ranch, Boerne, Texas.

FREE Literature — Make Big Money Raising Fishworms and Crickets. Carter Farm-11, Plains, Ga.

DETECTIVES—Work home—Travel. Experience unnecessary. Detective Particulars free. Write Wagoner, P-125 West 86th, New York 24.

MAKE \$25-\$50 week, clipping newspaper items for publishers. Some Clippings worth \$5.00 each. Particulars free. National, 81, Knickerbocker Station, New York.

PROFITABLE hobby adds to income. Operate Home Mail Order Business. Write Publicity, Box 727B, Kalamazoo, Michigan.

GET Big Mails—A Stamp Will Do. Taylor Enterprises, Export, Penna.

MEN — Women! Start Money-Making Plastic Laminating Business at home in spare time. Material that costs 11c brings back \$2.58. No canvassing or selling but mail orders bring in \$20 a day. Write for full particulars free. Rush name on postcard to Warner, Room CL-3-D, 1512 Jarvis, Chicago 26, Ill.

INCOME From Oil Can End Your Toil! Free Book, Maps! National Petroleum, Miami Beach Federal, Miami Beach 39, Florida.

\$1000.00 PROFIT Possible per sale showing our quality aluminum siding on your home. Details free. Aluminum Industries, Dept. PS-5, Kansas City 11, Mo.

OPERATE Home Art Studio. \$5.00-\$10.00 or more hour possible! Advertising agencies, magazines, stores (over 40 Big Fields)—large buyers of Free-lance art and cartoons. We show you how. Sell by mail. Fascinating home study system. Free Book. Write to Continental Schools, Dept. E-137, 4201 So. Broadway, Los Angeles 37, California.

MINK Raising information free. Complete. Lake Superior Mink Farm, Superior EE, Wisconsin.

HOME Mailorder "manufacturing." Everything supplied. Clenso Products, 184 Oakview, Winnipeg 15, Manitoba.

DRAW For Profit. Practical training at home can qualify you to earn additional income. Send your drawings to local publications, advertising agencies or International Syndicates. Huge profits involved. Free Book tells you how. Continental Schools, Dept. E-136, 4201 So. Broadway, Los Angeles 37, California.

\$10,000 YEARLY, drawing simple cartoons. Over 200 markets. Information free. Maler-5-55, 11620 Lansdowne, Detroit 24, Michigan.

AMAZING successes through franchises! Become exclusive franchise holder your territory. Information rushed. National Franchise Reports, SP-528, 333 North Michigan, Chicago 1.

HOMEWORK. \$1 brings list of companies offering homework. Eagle, Box 135, Bronx 60, N. Y.

BECOME A Notary Public. Win extra income, prestige, business contacts. Details free. Stationers Exchange, Box 166, Hannibal, Missouri.

WE purchase items you make at home for us. Enclose stamp for details. Wolfe Specialties, Box 171-A, Center Line, Michigan.

RECEIVE opportunities, offers, magazines—25c year. Roy's, Box 626, Easton, Penna.

QUICK Money By Mail Plan \$2.00 or Dime for details. Money Back Guarantee. Rusco, 694 Kerr, Columbus, Ohio.

39 PROFITABLE Ideas! Free Details! Hayes, New York Avenue, Manassquan, New Jersey.

IT'S True! You can make Quick Success in Mail Order our Easy Way. Details Free. "Co-Ops," 694 Kerr, Columbus, Ohio.

BIG boom in plastic business. Get in now. Get your share of the money. Learn the easy plans of making all the big selling plastic products of today. Free details. Gary Longmire, Dept. B13, 925 Bluff, Dubuque, Iowa.

FREE Advertising For Mailorder Items. Bravolt, 5718 Troost, North Hollywood, California.

LEARN the secrets of repairing junk batteries, generators, starters, profitable, easy, at home. Free particulars. Batteryman, Prunedale Station, Salinas, California.

PROFIT with your typewriter. My folio tells 10 ways you can make money by typing. Send \$1.00 to Hemlock Hill, Box 7198, Pittsburgh 13, Pa.

BE A Manufacturer! Or Promoter! License Government Patents Free! Details \$1.00. Dubs Information Service, Box 12525, Houston 17, Texas.

YOUR Own, Easy-To-Start, Home Mail- order Business, sparetime. Fascinating; profitable! Information free. Alfano, 19-PS Pine, Closter, New Jersey.

MAKE up to \$50.00 per day. Full or Part Time. Men or women; ideal money raising product for clubs and church groups. Send \$1.00 for details and brochure, refundable on first order. Raymar Enterprises, Box 602C, Lynwood, Calif.

LIST Of Fifty Firms Needing Home- workers—25c! Farmer, 210-R Fifth Ave., New York 10.

CIGARETTES—Make 20 plain or filter- tip for 9c. Factory-Fresh pipe tobaccos. Mild tropical flavored Philippine cigars. Facts free. Moberly, Box 4030, Owensboro, Kentucky.

38A BUY IT WHOLESALE

BUY Direct From Factories! Appliances, Cameras, Watches. Free Details! Cam Company, 436PB Bloomfield Avenue, Verona, New Jersey.

FREE! Name Brands Catalog! Your own high profit business. Sell Name Brands, full or part time. No inventory—no investment. More than 2000 Name Brand items; lowest wholesale prices. Watches, jewelry, cameras, hi-fi, stereo radios-phonos, appliances, housewares, hardware, power tools, luggage, musical instruments, garden equipment, sporting goods, toys, many others. 8 Floors of Name Brands. Million dollar inventory. Orders shipped complete within 24 hours. Send for Free beautifully illustrated catalog. Now! Separate wholesale price list. H. B. Davis Corp., Dept. PS, 145 West 15 St., New York 11, N. Y.

BARGAINS! Buy Wholesale! Save Money! Free Catalog! Norris, 273-L Merrick Road, Lynbrook, N. Y.

NEW Deluxe below wholesale catalog. Automobile catalog and others. Furniture, clothing, housewares, appliances, refrigerators, freezers, washers, dryers, television, radios, luggage, binoculars, hi-fi, stereo, phonographs, recorders, cameras, projectors, musical instruments, sporting goods, toys, tools, typewriters, watches, jewelry. Huge discounts on thousands of name brand items. For free specimen list of actual factory prices—postcard: Selbyco, Decatur 16, Illinois.

POWER Tools—Belt Sanders—Zipp Saws—Electric Planes. Write: Carpenter Wholesale, Box 127, Three Forks, Mont.

TOOL Catalog Send 25c. Silvo Hardware, 107-PS Walnut, Philadelphia 6, Pa.

DRUG Sundries. Complete Line Of Rubber Goods. Nationally Advertised Brands. Vitamins, Etc. Write For Free Catalog. Federal Pharmacal Supply, Inc., Dept. PS, 6652 North Western Avenue, Chicago 45, Illinois.

FREE Bargain Catalog. County Sales, 2935 Boston Road, Bronx 67, New York.

WORLD'S Largest wholesale supply. Buy from: 679 American, European, Japanese wholesalers. Tailormade suits from Hong Kong. 123 dropship catalogs. Rock-bottom prices. Free details. International Buyers, 216-PS Jackson, Chicago 6, Illinois.

350,000 BARGAINS! Free Merchandise! Write: Goldmine, 240-PT, Planetarium Station, New York City 24.

ELECTRIC Guitars, amplifiers, wholesale. Free Catalog. Carvin, PSW, Covina, California.

100,000 PRODUCTS Wholesale! Terrific Bargains! Wholesalers, 1265 Broadway, New York 1, N. Y.

WHOLESALE—Washer, Dryer, Refrigeration, Air Conditioning, Heating, Elec- tric Range, Water Heater, Major Appliance Parts and Supplies. Free Catalogs! Granger Co., 3rd Avenue and West Maryland Street, Evansville, Indiana.

38B IMPORT-EXPORT

IMPORT Tailored Clothing. Terrific Savings. Free Details. Lloyd & Company, Box 581, Joplin, Missouri.

SAMPLE German Export Publication Plus Valuable Worldwide Exporters Lists—50c Stamps. Burke Associates, Manchester, Mass.

39 FORMULAS, PLANS, ETC.

FORMULAS—All Kinds. Amazing Big Catalog 10c. Kemisco, Park Ridge 15, Illinois.

LATE Modern Manufacturing Formulas List Free. Chemical Service, Martville, New York.

40 PLASTICS

NEW Liquid casting plastic, clear, colors. Embed real flowers, butterflies, photos, coins. Send 25c for two handbooks "How to Cast Liquid Plastics" and "How to Make Extra Money at Home." Castolite, Dept. E-102, Woodstock, Illinois.

PLASTIC Embedding for fun and profit, no oven. Make beautiful jewelry, decorative panels, science specimen castings. Catalog 25c. Natcol Plastics, Box 444, Yucaipa 4, California.

POPULAR SCIENCE OPPORTUNITIES

EMBEDDING, casting secrets free. Sample, 25c. Crystal, 4350-H N. Whipple, Chicago 18.

PLEXIGLAS — Any thickness — Clear — Colors — Cut to size — Clear Rods — Tubing. McClarin Plastics, P.O. Box 168B, Hanover, Pennsylvania.

41 SCIENCE & CHEMISTRY

AMAZING New Book Of Science Experiments, formulas and Catalogue of Laboratory Supplies. Only 35c. National Scientific Co., Dept. PS-5, 13 S. Park Avenue, Lombard, Illinois.

NEW Concepts in physics and astronomy comprising a unique structural explanation for the subatomic particles and their forces. Nuclear theory challenged. New 1963 edition. 25 cents postpaid. C. F. Krafft, 4809 Columbia Road, Annandale, Virginia.

UNUSUAL Chemistry books, courses, kits! Rare chemicals, cheap! Catalog 25c. National, Box 133-A, Palo Alto, Calif.

ROCKETS: New Illustrated Catalog 25c. Single And Multistage Kits, Cones, Engines, Launchers, Trackers, Technical Information, Etc. Fast Service. Estes Industries, Penrose 6, Colorado.

FREE 3 Pyrex test tubes with purchase \$3.00. Catalog 25c. Chemicals, Apparatus, Biology, Mid-States Scientific, 7053 N. Clark, Chicago, Ill.

ILLUSTRATED Catalog: Chemistry, mineralogy, biology 25c. Tracey Laboratories, Evanston, Illinois.

ROCKETEERS New Catalog 25c. Kits, Engines, Materials, Apparatus Pyrofuze. Central Rocket Company, Waupaca, Wisconsin.

CHEMICALS and apparatus for industrial, analytical and private laboratories. Catalog 35c. Dept. M-26, Biological Supply Co., 1176 Mt. Hope Ave., Rochester 20, N. Y.

SEARCHING For Economically Priced Chemicals and Apparatus? Catalog and Gift 25c. Starr Scientific, Manitowoc, Wisconsin.

EXPERIMENTER'S Handbook Free With Bigger Catalog 25c. Hagenow Laboratories, Manitowoc, Wisconsin.

ROCKETRY Supplies: Kits, Engines, Cones, Tubes, Launchers, Firing Panels. Latest illustrated catalog 25c. Centuri Engineering Co., 340 W. Wilshire, Phoenix 3, Arizona.

PYROCHEMICALS and apparatus. Unichem., Box 3626 Grand Central Station, New York 17.

SCIENCE projects materials. 1,000 small quantity chemicals, biology supplies. Catalog 25c. Winn Chemicals, 124-P West 23rd, New York 11, N. Y.

FREE—Pair of chemical resistant polyethylene gloves with catalog. Low priced chemicals, Biologicals, and Apparatus. New Pyrotechny section just added to catalog. New Illustrated catalog only 35c. Dover Scientific, 35-24 31 St., Astoria 6, New York. Open all day Saturday.

42 EMPLOYMENT INFORMATION

FOREIGN—U.S.A. jobs. All occupations. Up to \$1600.00 monthly. Free transportation, benefits. Complete "directory." Application form. Send \$1.50 (\$2.00 airmail). Why pay more? C.O.D.'s accepted. Satisfaction guaranteed. International Employment, 152 W. 42nd, Suite 536-C5, New York 36, New York.

FOREIGN Employment. Construction, other work projects. Good paying overseas jobs with extras, travel expenses. Write Only: Foreign Service Bureau, Dept PS, Bradenton Beach, Florida.

FOREIGN—U.S.A. jobs. All occupations. Up to \$1600.00 monthly. Free transportation, benefits. Complete "directory." Application forms. Send \$1.50 (\$2.00 airmail). Why pay more? C.O.D.'s accepted. Satisfaction guaranteed. International Employment, Box 191-C5, Bedford, Indiana.

RÉSUMÉS by Richton open doors quickly to best jobs. Expertly prepared, written and printed. Satisfaction guaranteed. We serve clients the world over, in every field, entirely by mail. Bonus features. Free descriptive literature. Write The Richton Company, Dept. SS, 11 Hill Street, Newark, New Jersey.

FOREIGN Employment Information Job Possibilities Up To \$1600 Monthly In Europe, Africa, Asia, South America. Free Transportation. Construction Workers, Clerks. Hundreds of Occupations Men, Women. Complete Information. Proper Application Form Sent Promptly. Satisfaction Guaranteed. Send \$2.00 (\$2.25 Airmail) (C.O.D.'s Accepted) To: Jobs, P.O. Box 50512, Dept. F, New Orleans 50, Louisiana.

JAPAN! Korea! Okinawa! Many hi-paying jobs available. Complete, detailed reports \$2.00. Japan Reports, Box 2202-E, Newport Beach, California.

DIRECTORY Reports. Construction, aviation, shipping, oilfields, government, manufacturing, trucking, etc. Foreign-Stateside. Helpful information plus job-getting tips on preparing application letters. Unconditional money-back guarantee of satisfaction. Act Today. Only \$3.00. (\$3.25 Airmail) (C.O.D.'s Accepted) Research Services, Meramec Building, St. Louis 5-PS, Missouri.

WORK For the U.S. Government. Send \$1.00 for next five monthly issues containing announcements of Federal job examinations. Good pay plus fringe benefits. Civil Service Reporter, Dept. P.S., 330 Newbury Street, Boston 15, Massachusetts.

MERCHANT Marine. Men—Women. Top Wages. Travel. Information. Harvey, 1402-PSM, Englewood, Colorado.

OVERSEAS Jobs. Excellent worldwide jobs. All Occupations. Men, Women. To \$1600 Monthly. Private and governmental. Free transportation. Satisfaction guaranteed. Send \$1.00 to Jobs Overseas, 220 Thompson Street, New York 12, N. Y.

UNEMPLOYED — Want Advancement? Place your name and complete information on our international, national and local lists—Two Weeks \$1.00. Fast action, lists compiled and distributed daily, many, many immediate openings. Associates Listing Service, Box 2074, Kalamazoo, Michigan.

43 AGENTS WANTED

EARN Big Money introducing amazing Color-V. Makes ordinary TV show in beautiful colors. Low \$2.98 price—sells like hotcakes. Free details. Excellent Buys, (Dept. PS-6), 34 E. 12th, N.Y.C.

YOUR Own business—Suits \$1.50; Overcoats 65c; Mackinaws 35c; Shoes 12½c; Ladies' Coats 30c; Dresses 15c. Enormous profits. Catalog Free. Nathan Portnoy Associates, 2109-J Roosevelt Road, Chicago 8, Ill.

EVERY Man A Prospect. Refundable sales kit offer showing line belt buckles, tie clasps, money clips, cuff links, lapels, identification badges, individualized with customer's name and emblems. Cap badges for trucking, bus, taxi, police, firemen, also heavy construction emblems. Choice 3000 emblems. Hook-Fast, Box 1088PS, Providence, R. I.

DEALERS Wanted . . . Men, Women Write: Wilknit, Adv. C2035, Greenfield, Ohio.

NEW National Teenage Craze Means Money For You. Write Immediately! Asche, 1608 Nelson, Chicago 13, Illinois.

FREE Sample, Beautiful Curios! Sell on Sight! Apartado 9036, Mexico City.

MAKE Most Extra Cash with world's biggest line everyday greeting card assortments, gifts. Introduce friends, neighbors, to over 150 assortments. 500 big money-makers. Pocket up to 100% profit plus big cash bonus. Free giant color catalog; samples on approval. Write Arrow Greetings, 513 Fourth Ave., S., Dept. 84-D, Minneapolis, Minn.

EXOTIC Earrings! Details free. Pair \$1.00. Ohga, PS-438, Sigakenkusatu, Japan.

START Your Own Business On Credit. Your own boss, 1125 Dealers sold \$5,000 to \$25,500 in 1962. We supply stocks, equipment on credit. 275 home necessities. Sales experience unnecessary. Pleasant, profitable business backed by world-wide industry. Write Rawleigh, Dept. E-U-PSC, Freeport, Ill.

5 USED Watches—\$6.00. Joseph Bros., 5-C So. Wabash, Chicago 3, Ill.

WANTED: Agents for new imported 8MM camera. The Robinson Co., 15468 Hiway 80, El Cajon, Calif.

SELL on sight handmade African curios. Samples, catalogue \$10. Door Delivery. Kenbros, 1924, Mombasa Kenya.

44 HIGH-GRADE SALESMEN

SENSATIONAL new longer-burning Light Bulb. Amazing Free Replacement Guarantee—never again buy light bulbs. No competition. Multi-million dollar market yours alone. Make small fortune even spare time. Incredibly quick sales. Free sales kit. Merlite (Bulb Div.), 114 E. 32nd, Dept. C-74-G, New York 16.

YOUR free copy of World's biggest sales magazine tells you how and where to make more money on your own in selling. Write Specialty Salesman Magazine, Desk 6B, 307 North Michigan, Chicago 1.

Make Extra Money Selling advertising matchbooks. Free catalog and sales outfit. Matchcorp, Dept. PS-53, Chicago 32.

EARN Big Commissions Full Or Part Time. Show America's largest line low priced business printing and advertising specialties. Big Free Sales Kit samples hundreds items used daily by business people. Build profitable repeat business. Start right now. National Press, Dept. 9, North Chicago, Illinois.

MAKE Up to \$50.00 Daily, listing delinquent accounts from business, professional men. Free Sales Kit. General Finance, Dept. AR-5, Pickwick Bldg., Kansas City 6, Mo.

\$3.00 UP Hourly for Route Work. Permanent. Write McNess, Freeport 43, Ill.

\$1,000.00 A month for making dramatic 3-second demonstration of amazing lightweight Presto Fire Extinguisher. New chemical used by Airforce snuffs out fires instantly. Only \$4.95. Terrific commissions. Millions want it. Free Kit. Merlite, 114 E. 32nd, Dept. 66-G, New York 16.

SELL Advertising Book Matches. Write us today; we put you in business By Return Mail, handling complete line Ad Book Matches in demand by every business right in your town! No investment; everything furnished Free! Top commissions daily! Superior Match, Dept. P563, 7530 S. Greenwood, Chicago 19, Ill.

SELL Calendars And Advertising Specialties—Most Businesses Buy Them—Free Sample To Start. Simply Show Samples—They Sell Themselves. Liberal Commissions, Free Premiums, Cash Bonuses. Full or Part Time. Fleming, 6535-P Cottage Grove, Chicago 37, Ill.

EASY To Make Big Money Showing Beaver Shoes to friends, relatives. Look like leather, wear far longer. Made of Everon, retail \$2.29 to \$5.59. Big commissions advanced. Beaver Shoes, Dept. PS-563, Beaver Meadows, Pa.

AMAZING New Portable 49c meal! Unbelievable! Needs no refrigeration. Be First! Test: \$1 for 3 meals. Comidex Corporation, New Canaan 17-B, Connecticut.

45 EDUCATIONAL & INSTRUCTION

LEARN Civil and criminal investigation at home. Earn steady, good pay. State age. Institute Applied Science, 1920 Sunnyside, Dept. 335, Chicago 40, Illinois.

MASTER Watchmaking at home. Free sample lesson. Chicago School, 2328-WR Milwaukee, Chicago 47.

HIGH School Diploma at home. Licensed teachers. Approved materials. Southern States Academy, Station E-12, Atlanta, Ga.

LEARN While Asleep with your recorder, phonograph or amazing new "Electronic Educator" endless tape recorded. Details free. Research Association, Box 24-NN, Olympia, Washington.

BECOME Tax Consultant. Graduates earn \$1,000-\$3,000 every tax season preparing returns evenings. State approved. Union Institute, Lakewood Z-1, N. J.

WANT a Diesel Job? Higher Pay? Advancement? We can help you qualify! Complete Diesel Tractor and Heavy Equipment and Cummins Diesel Engine Shop-method home-training courses available. Write today. Interstate Training Service, Dept. B-2, Portland 12, Ore.

BOOKKEEPERS — Operate Your Own "Dollar-A-Week" System. Ellis, Box 203, Cedar Grove, North Carolina.

PIANO Tuning Pays. Big money in spare time. Learn at home. No musical knowledge necessary. Phonograph, records, tools and instructions furnished. Electronic tuning also taught. Free catalog. Capital Tuning School, 3160 S.W. 16th Court, Ft. Lauderdale, Fla.

GOOD paying jobs open! Operate, repair heavy earth moving equipment! Learn "on the job" operating latest cranes, bulldozers, earth carriers! V. A. Approved Free Catalog. Write S. E. Hutch, Greer Technical Institute, Braidwood, Illinois.

FCC LICENSE in 6 weeks, First Class Radio telephone. Results Guaranteed. Elkins Radio School, 2603A Inwood, Dallas, Texas.

FINGERPRINTING and Identification easily learned at home. Diploma awarded. Alabama School of Fingerprinting, Fairfield, Alabama.

PIANO Tuning quickly learned with home study course. Diploma granted. American Tuning School, Gilroy, California.

MISSOURI Auction School. Free catalogue. 1330 Linwood, Kansas City 9-x5, Missouri.

REAL Estate Course. Economical home-study. Literature free. Howard Schools, Box 8394-B, Kansas City 5, Missouri.

BE A Real Estate Broker. Insure Security for yourself and your family. Study at home. Prepare for state examination. GI approved. Write for Free Book Today. Weaver School of Real Estate, 3519R Broadway, Kansas City, Missouri.

HIGH School At Home in spare time with 66-year-old school. No classes. Standard high school texts supplied. Single subjects if desired. Credit for subjects already completed. Progress at own speed. Diploma awarded. Information booklet free... write today! American School, Dept. X546, Drexel at 58th, Chicago 37.

LEARN I.B.M. At Home—A complete course in punched card data processing—the most progressive opportunity field of the decade! Can easily be completed without job interruption—V.A. approved. Send Today for free course outline. Business Service Associates, Inc., Dept. PS-10, 1814 South Main Street, South Bend, Indiana.

ROCKETS: New illustrated catalog 25c. Single and Multistage Kits, Cones, Engines, Launchers, Trackers, Technical information, Etc. Fast Service. Estes Industries, Penrose 33, Colorado.

GRAPHOANALYSIS — Learn scientific handwriting analysis for profit, pleasure. Free sample lesson, catalog reveals plan. Write IGAS, Inc., 325 Jackson, Dept. 2CY-1, Chicago 6.

WOODWORKING and Cabinetmaking course for beginning and advanced home craftsmen. Only complete low-cost home training program available. Write for free booklet. Interstate Training Service, Dept. G-2, Portland 12, Oregon.

MEN wanted. Learn Auto-Diesel Mechanics in our shops. Learn with tools on real equipment. Earn While You Learn. Many of our graduates earn \$125 a week and up. Write for free bulletin. Auto-Diesel College, Dept. 262, Nashville 3, Tenn.

LEARN Electricity, Appliance Repair, and Slide-Rule Calculations in 32 Compact Lessons. World-Wide School, 2555 Shelley Drive, Indiana, Penna.

ENGINEERING And Art Degrees earned through home study. Electronics, Mechanical, Liberal Arts, Major Accounting. When writing specify course desired. Pacific International College of Arts & Sciences, primarily a correspondence school. Resident classes also available. 5719-A Santa Monica Blvd., Hollywood 38, California.

OWN local collection office. Pays big. Franklin Credit, Roanoke, Virginia.

DRAFTING. Blueprint Reading, Schematics. Send \$2.00 first lesson, complete home course \$25.00. Prior Inc., 23-09 169 Street, Whitestone 57, New York.

ENGINEERING Mathematics. Electronics. Pay as you learn. Free brochure. Indiana Home Study, 64 Hemenway Road, Framingham, Mass.

BE A Tutor of reading. Private tutors of the Phonics Method are in desperate demand. Earn from \$5 to \$10 an hour. Study at home. Details free. Reading Arts Academy, 1100 West "Q," Wilmington, California.

PENMANSHIP Corrector: Improve poor penmanship quickly. Details free. Ozment, Box 665 35, St. Louis 88, Mo.

USED Courses! Books! List 10c. Smith's, 124 Marlborough, Salem, Mass.

DENTAL Technician's Home Study Student's Kits. Instruments, plastic, etc. Illustrated instructions. Write for Free lesson. Grant Laboratory, Haas Bldg., Los Angeles 14, Calif.

EARN as you learn, camera repair. National Camera Repair School offers accredited Home Study Course—Instructions, texts, tools and practice equipment. Free information. Write Box 174PE5, Englewood, Colorado, today!

DYNAMIC speaking, singing. Self-training records. Amazing!! Canfield, 2018-C Fifth Avenue South, Minneapolis 4, Minnesota.

USED Correspondence Courses, Books. Catalog 10c. Bayles, 78-D Courtright, Wilkes-Barre, Penna.

IMPROVE Health, Lose Weight, Control Habits With Transitional Sleep Tapes! 92% Effective! Details Free. A.S.R. Foundation, Box 7021Z, Henry Clay Station, Lexington, Kentucky.

ACCOUNTING! Professional coaching. Reasonable. Cyrus, P.O. Box 8423, South Charleston 3, W. Va.

GET A British Degree. Divinity, Philosophy, Healing, Metaphysics. 35 courses. Prospectus Free. Brantridge Forest School, "Lodge" Brantridge, Balcombe, Sussex, England.

MODERN Bridge Bidding Technique Course. Contact: Cabral, 25 Lincoln, Greenwich, Conn., For Sample Lesson.

ENGLISH Language Arts Tutoring By Mail. Reading Clinic, 27 Spring St., So. Braintree 85, Mass.

PHOTOGRAPHY: Earn Big Money. Travel. Own your own studio. Learn at home in your spare time. Write for big free Book. School of Modern Photography, Dept. C-563, Little Falls, N. J.

USED Correspondence Courses and Books sold and rented. Money back guarantee. Catalog free. (Courses Bought.) Lee Mountain, Pisgah, Alabama.

47 DETECTIVES

DETECTIVE Profession. Home Study. Lapel pin, Certificate, Future. Box 41197-G, Los Angeles 41, California.

DETECTIVE Course. Credentials. Diploma. Free Information. Southwestern Institute Criminology, Box 202, Geronimo, Oklahoma.

INVESTIGATORS, free brochure, latest subminiature electronic listening devices. Ace Electronics, 11500-F NW 7th Ave., Miami 50, Florida.

DETECTIVE training. Career for young and old, men and women. For free information write to 1917-C North Kenneth Avenue, Chicago 39, Illinois.

DETECTIVES—Work home—Travel. Experience unnecessary. Detective Particulars free. Write Wagoner, P-125 West 86th, New York 24.

48 LANGUAGE OUTFITS

ESPERANTO. UNESCO's interlanguage. Text, Pronunciation record \$1. Esperanto, Dept. P.S., Middleton, Wis.

50 BUSINESS SERVICE, INFORMATION, NAME LISTS

MAILING Lists most all kinds 1000 \$5.00. FREE folder. Your circulars mailed \$4.00 1000. Dixie Mailers, King, N. C.

MILLION Names! State your needs. National Coverage High School Seniors and Births. Box 48, New Munster, Wisconsin.

51 SPECIAL SERVICES

BIBLE Questions answered free. Bible Research, 1819 LaPosada, National City, California.

LOCATING Service! Any Item or Product. Jake Barraco, 478 Gardner, South Beloit 1, Illinois.

PROPERTY Mapping our specialty. Free estimates. Write Deed-Ettes, Mt. Pocono, Pennsylvania.

51A I Q TESTS

ACCURATE, inexpensive. Home-administered, professionally interpreted. Children. Adults. Research data needed. University Testing Institute, R-14, Box 6744, Stanford, California.

52 AUTHORS SERVICE

WRITERS! N. Y. publisher wants "how-to" book manuscripts and other subjects (fiction, nonfiction). Two free brochures reveal tips on writing; how to become published author. Write Paula Scottsdale, Exposition Press, 386 Park Avenue South, New York 16, New York.

PUBLISH your book! Join our successful authors: All subjects invited. Send for free appraisal and detailed booklet. Carlton Press, Dept. PSQ, 84 Fifth Avenue, N.Y.C. 11.

WANT Your Book Published? Learn how we publish, advertise, promote, distribute. Many successes. Free booklet PS, Vantage, 120 West 31, New York.

53 ADVERTISING, AGENCIES, ETC., FOR ADVERTISERS

FREE expert assistance for mailorder advertisers. Ratebook leading newspapers, magazines 10c. Chicago Advertising Agency, 28 E. Jackson, Chicago 4.

ADVERTISE: Sunnyview Opportunity Review, 10c per word, copy 25c. Florence Martineau, Park Avenue, Oconto, Wisconsin.

BRITAIN'S "Exchange & Mart." Sixty classified pages weekly. Three months—\$2.45. English Imports, Box 1093-PS1, Minneapolis 40, Minnesota.

54 ART INSTRUCTION, CARTOONING, SIGN PAINTING

"HOW to Make Money With Simple Cartoons"—A book everyone who likes to draw should have. It is free; no obligation. Simply address Cartoonists' Exchange, Dept. 195, Pleasant Hill, Ohio.

STOP Dreaming. Start Drawing. New system brings amazing results inexpensively, quickly. See for yourself. Free Book. No obligation. Continental Schools, Dept. E-138, 4201 So. Broadway, Los Angeles 37, California.

ART Lessons—\$6 a month. Includes Drawing, Painting, Commercial Art, Art Kits (worth \$25) and materials. Assignments corrected, with overlays, by mail, and returned to you. Write for free book. No obligation. Washington School of Art, Studio 155X, Port Washington, L. I., N. Y.

CARTOONING! Learn For Profit! Delineator, 703 Forest Hills, Wilmington, N. C.

SIGNS! Faster Method! Free Information. Harris, Box 1567-SM, Portland 7, Oregon.

LEARN Profitable Magazine Cartooning! Free Details. Cartoonists, Box 3097, Lincoln 10, Nebr.

LEARN Sign Painting. Fascinating System. Straley, 410-P South Western, Springfield, Ohio.

YOU can Entertain with Chalk Talks. Catalog 10c. Cartoonist Balda, Oshkosh, Wisconsin.

PROFITABLE Sign Course For Beginners. Hal Barebo Signs, O'Fallon, Mo.

55 TYPEWRITERS & OFFICE MACHINES

RECONDITIONED Typewriters, Mimeograph, printing presses \$25.00 up. Write Dixiegraph, King, N. C.

56 RUBBER STAMPS & OFFICE SUPPLIES

FREE Booklet. Indexed Rubber Stamps. Dowling Products, Dept. PS6, Pittstown, N. J.

3 LINES (with ink-pad) \$1.00. Printers, 181 First, Tupper Lake, New York.

FREE 32 Page Rubber Stamp Catalog. Signature Stamps \$3.50. Youngers Stamp Shop, Princeton, Iowa.

THREE line pocket or office stamp \$1.00. Win Atherton, Box 61, Randolph, Massachusetts.

POROUS Rubber Stamps. Require no ink pad. Free Catalog. Melco, Box 53331-PS, New Orleans 50, La.

57 PRINTING, MULTIGRAPHING, ETC.

FREE Catalogs. Postpaid printing, Rubber stamps. D M Press, Sebastopol, Calif.

1000 GUMMED Name & Address Labels \$1.00. Perk's, Essex, Mass.

100 6 3/4 ENVELOPES. 100 5 1/2 x 8 1/2 Letterheads printed, \$2.35. M. Fortney, R3, Dillsburg, Penna.

AMAZING Business Printing values. Samples. Print Shop, Box 576P, Greenville, R. I.

ATTRACTIVE—Modern Business Stationery. Color. Cuts. (Samples). OKay-print, Martins Ferry, Ohio.

OFFSET printing. Some shipped day received. Mimeo Press, Rocky Mount, N. C.

1000 BUSINESS Cards. "Raised Letters" \$3.75 postpaid. Samples. Routh PS-5, 3910 Kipling, Greensboro, N. C.

POPULAR SCIENCE OPPORTUNITIES

1000 NAME, Address Labels \$1.00. Rubber Pocket Stamp \$1.00. 1000 Business Cards \$3.95. Printing, Personalized Items. Free Literature. Jordan's 552 West O'Connor, Lima, Ohio.

100 8 1/2 x 11 Letterheads, Hammermill Bond \$1.75. Pierce, 325 Arrow, Signal Mountain, Tenn.

POSTPAID Business Printing. Request free samples. Crestview Printing, Owasso, Okla.

MIMEOGRAPHING. Offset Printing. Free samples. Pennsaw, Drawer 1340, Scranton, Pa.

58 PRINTING OUTFITS, SUPPLIES

NEW 1962-63 illustrated printing equipment and supply catalog. This 9 x 12", 336 page book is the most complete catalog of the century. Contains everything used in the graphic arts industry including thousands of offset, letterpress, bindery, rubber plate and stamp, composing room, silk screen, art and engraving supplies and equipment. Includes paper cutters, folding machines, printing & proof presses, padding presses and many more. Send \$2.00 to cover mailing. Refund with first order. Also available is our latest 184 page type catalog—add \$1.00. American Printing Equipment & Supply Co., Dept. PS, 42-25 Ninth Street, Long Island City 1, N. Y.

PRINTING Outfits, type, supplies. Send dime for illustrated supply book and samples. Kelsey, Inc., H-8, Meriden, Conn.

RUBBER Stamp Presses, Hydraulic Operated. Electrically heated. Sizes 5"x8", 8"x12", 10"x15", starting outfits, supplies. Printing Presses, Custom Manufacturing, 1464 East Commercial, Springfield 2, Missouri.

PRINTING Presses, Type, Supplies. Lists, 5c. Turnbaugh Service, Mechanicsburg, Pa.

MAKE Your Own self-molding rubber stamps and printing cuts. Plexirubber, Argyle 2, Wisconsin.

TYPE case catalog. Manufacturer. King McKay Company, 23179 Telegraph, Southfield, Michigan.

RUBBER Stamp Presses, Supplies. Kiewiet, 2025 Barney Road, Kalamazoo, Michigan.

INDEXTABS. 60 different self sticking plastic numbers, letters and months. \$1.00 per kit. Oaklane Products, Box 329, Scarsdale, N. Y.

59 PATENT ATTORNEYS

WASHINGTON Patent attorneys—List free. Patent Information Service, 624 Sheraton Building, Washington 5, D. C.

60 FOR INVENTORS

PATENT Searches—48 hour airmail service, \$6.00. including nearest patent copies. More than 200 registered patent attorneys have used my service. For Free invention protection forms, write Miss Ann Hastings, P.O. Box 176, Washington 4, D. C.

WE buy ideas, inventions—back inventors! Details 25c. C. Johnson, 5717 Estes, Ft. Worth 19, Texas.

INVENTIONS wanted immediately for promoting on cash or royalty. Patented, unpatented. Free booklet outlines royalty sales, requirements. Write Kessler Corporation, C-75-FI, Fremont, Ohio.

PATENT Searches, including copies of related U.S. Patents, \$6.00. Inventors, attorneys, manufacturers use my "Worldwide" Airmail service! "Invention Record" form and "Information Every Inventor Needs", sent free! Miss Hayward, 1029 Vermont Ave. NW, Washington 5, D.C.

SAVE High fees! Prepare your patent application yourself! New "Do-It-Yourself" Patent Kit now makes it easy. Free "Registration Form." Miss Blaine, 306 Carry Building, Washington 5, D.C.

SAVE Big fees! Prepare your Patent Application yourself. Details free. Inventors Guide, Fort Worth 14, Texas.

\$2.00 FOR Valuable Patent Information. Gem, Box 331, Fairmont, West Virginia.

WASHINGTON Patent attorneys—List free. Patent Information Service, 624 Sheraton Building, Washington 5, D. C.

INVENTORS, if you have an invention for sale, patented or unpatented, write Institute of American Inventors, Dept. 30A, 635-F St., N.W., Washington 4, D. C.

INVENTORS: Prepare your own patent application. Our "Patent Kit" includes detailed instructions and all necessary material. \$12.95. Money back guarantee. National Inventors Company, Box 88, Ben Franklin, Washington, D. C.

PATENTS prepared. Complete applications, \$100. up. Inventors Service, Box 322, Duluth, Minnesota.

PATENT Searches, professional patent development of inventions by Licensed Professional Patent Engineer and U.S. Patent Office Former Examiner with staff of engineering specialists in all fields of inventions. Expert searches performed in the U.S. Patent Office. Your inventions and ideas engineered for maximum patent protection and greatest commercial value. Inventions developed by us negotiated for cash or royalties with our nationwide contacts. Send for free Protection "Invention Certificates" and further interesting, valuable Patent Information. George Spector, Licensed Professional Patent Engineer, U.S. Patent Office Former Examiner, Woolworth Building, New York.

PATENTS Skillfully Prepared for maximum commercial value with useful product development. High record of success in proving and claiming patentability. Valuable market service. Patents prepared and filed for service fee as low as \$200.00. Send for self protecting invention record forms free. Patent search with valuable engineering report \$10.00. Foreign patents filed at lower cost. Thirty Years established. Joseph O'Brien, Patent & Development Engineer, 132 Nassau Street, New York 38, N. Y.

PATENT Searches, \$6.00, including official Patent Office copies of related U.S. Patents. Certified. Airmailed! For free "Invention Record" and "Patent Information", write: United States Inventors Service Company, 1311 "G" Street, NW, Washington 5, D. C.

PATENT Searches including Maximum speed, full airmail report and closest patent copies, \$6.00. Quality searches expertly administered. Absolute confidence and secrecy guaranteed. Free Record of Invention forms and "Patent Information." Write Washington Patent Office Search Bureau, 1426 G Street, N.W., Washington, D. C.

U.S. Patent Office Searches—\$5.00. Free Invention Record. Patents Engineered. Patent Office Searchers, 233 Broadway, Room 3615, New York.

PROFESSIONAL Patent searches, \$6.00. including official copies of related U.S. Patents! Prompt, dependable Airmail service! For free "Invention Record Folio" and "Information Every Inventor Should Have", write: Congress Invention Institute, 210 McKim Building, Washington 5, D.C.

INVENTORS—Complete Names And Addresses Of Attorneys And Agents In Your State Registered To Practice Before United States Patent Office. List \$2.00. D. J. Pfanz, 12 North Mulberry Street, Du Quoin, Illinois.

PATENT searches including report \$6. Valuable market service. Cash or royalty sales. 10 years dependable service. For free self-protective Record of Invention forms write: H. Lawrence Blasius, 19 Park Row, New York 38, N. Y.

PATENT Searches, complete and thorough. Related copies Air Mailed with maximum speed \$6.00. Free Protection Forms, and "Patent Information." Write Mercury Patent Office Searchers, 1507 M Street N.W., Suite 103, Washington, D. C.

PATENT Searches, prompt, complete \$6.00. Patent Office copies of related patents airmailed. For free "Protection Forms" and "Patent Information" write to Jane Allen, Suite 1024, Dupont Circle Bldg., Washington 6, D. C.

PROFESSIONAL Searches of the Patent Office. Dependable—Reliable \$6.00 including airmail report and related patents. For free Protection Forms and "Patent Information," write Trans-World Patent Service, 500 Walker Building, Washington 5, District of Columbia.

DON'T tell me your invention, but field. Completely prepared own seventeen patents. You too can. Want proposal, including listed patent numbers? Aberly, 124 Eighth St. N.E., Cedar Rapids, Iowa.

FREE—"Vital Information Every Inventor Needs Before Selling Invention." Adams, 15 Park Row, New York City.

61 INVENTIONS WANTED

INVENTIONS wanted. Patented; unpatented. Tremendous Manufacturers lists. Global Marketing Service, 2420 77th, Oakland 5, Calif.

INVENTORS: Hundreds of manufacturers have requested our assistance in locating marketable new products. Complete information free. Institute of American Inventors, Dept. 30C, 635-F Street, N.W., Washington 4, D. C.

"TWENTY Inventions Wanted by U.S. Government." (Information concerning hundreds more). Special Report, \$1.00. Folborg Research Agency, Box 46, Brooklyn 37, New York.

INVENTIONS wanted immediately for promoting on cash or royalty. Patented, unpatented. Free booklet outlines royalty rates, requirements. Write Kessler Corporation, C-75-IW, Fremont, Ohio.

INVENTIONS Promoted — For Cash-Royalty Sales with Manufacturer Contacts. George Spector, Licensed Invention Engineer, Woolworth Building, New York.

INVENTORS! Sell your invention for cash or Royalties! Our client manufacturers constantly seeking new items. Patented. Unpatented. For free information write Gilbert Adams, Patent Broker, 80 Wall St., Financial District, New York, N. Y.

INVENTORS Needing Help with any problem, financial, development, securing manufacturer, obtaining patent. Write the organization that delivers action and results—not promises. Pioneer Invention Service, 150 Broadway, New York 38, N. Y.

CASH or royalties for inventions! Consider our offer first before licensing or selling your patented or unpatented invention. Write—Aladdin Industries, 80 Wall Street, New York 5, N. Y.

INVENTORS! We will develop, sell your idea or invention (patented or unpatented)! Our national manufacturer-clients urgently seeking new items for highest outright cash sale or royalties. Financial assistance if needed. 10 years proven performance. For Free information write: Wall Street Invention Brokerage, 79 Wall Street, Financial District, New York 5, N. Y.

INDUSTRY needs inventions immediately. Inventions for Industry was organized to discover and assist new inventors. Write Invention for Industry, 150 Broadway, New York 38, N. Y.

INVENTORS! Outright cash sale or royalties for your inventions. Patented. Unpatented. Constant demand from our client manufacturers. Write United States Invention Brokerage, 78 Wall Street, New York 5, N. Y.

INVENTORS! Don't sell or license your invention for cash or royalties until you receive our offer. Development service and financial assistance available. For Free information, write International Invention Institute, 17 Park Row, New York 38, N. Y.

INVENTIONS Sold. Licensed. Cash-royalty basis. Inventions International, Box 560 Wall Street, New York 5, N. Y.

62 PATENTS FOR SALE

SEE The VooDoo Dowser As Advertised on Page 33. Write For Details: The Krogen Laboratory, 809 N. Janiss St., Anaheim, Calif.

64 MODELS, MODEL SUPPLIES

FREE Plan for Miniature Steam Engine included in New illustrated comprehensive Model Engineering Supplies Catalog; largest selection model gasoline, steam-engine casting kits; 1962 catalog 35c. Octura Models, 8148 Milwaukee Ave., Niles 48, Ill. Dept. FPS.

SHIP and yacht model fittings; blueprints. Send 50c for illustrated catalog listing hundreds of items. A. J. Fisher, Inc., 1002-2 Etowah Ave., Royal Oak, Michigan.

SHIP Models, Kits, fittings, plans, books, tools, engines, motors. Big illustrated catalog 50c. James Bliss & Co., Dept. PS, 342 Atlantic Avenue, Boston 10, Massachusetts.

SHIP Model Kits and fittings; clippers, frigates, etc. Catalog, paint-tool list, book list, 35c. Model Shipways, Box 85, Bogota, New Jersey.

This One



T2J9-Q6E-ZYG5

ROCKETS: New Illustrated Catalog 25c. Single And Multistage Kits, Cones, Engines, Launchers, Trackers, Technical Information, Etc. Fast Service. Estes Industries, Penrose 3, Colorado.

MODEL railroaders, Cerrosafe miracle alloy for weighting, locomotives, cars, molten at 190°. Cast in cardboard molds. Trial order \$1.00. Cerro Sales Corporation, 312 Park Ave., New York 22, N. Y.

SHIP Model Kits, Clippers, Galleons, Liners; Operating Power Boats for Radio Control; Send 25c for Catalog. Ideal, 17 West 18 Street, New York 11, N. Y.

CASTINGS and finished Steam—Gas Engines from simple oscillating to triple expansion. Finest materials and fittings. Catalogue \$1.00. Denison Live Steam Models, PS, 1606 Denison, Cleveland 9, Ohio.

BUILD Miniature Buildings With Professional Materials. 50c For Instructions And Samples. Architectural Model Materials, PS53, 2008 No. Keystone, Chicago, 89.

65 HOME CRAFTSMAN

SKIL-CRAFTS New '62-'63 Catalog. Largest and Finest selection of Leathercraft, Artist, Hobbycraft supplies in the world. Free Gift with first order. Send 50c. Refundable with first order. Skil-Crafts, Box 167-PS, Joplin, Mo.

PICTURE Frame Moldings, Tools and Instruction book. Free Catalog. Chesapeake Frames, 414-PS E. Baltimore St., Baltimore 2, Md.

FREE "Do-It-Yourself" Leathercraft Catalog. Tandy Leather Company, Box 791-E47, Fort Worth, Tex.

SAVE: Raw picture frame moulding, all species, all styles. We will miter corners. Bauerle Cabinet Works, Inc., Hammond, Louisiana.

SQUAREKNOTTERS: Make belts, handbags, lanyards, dog leashes, etc. Special offer! Beginner's book, catalog and quality cord samples 25c. P. C. Herwig Co., Dept. 71-P7, 39 Henry St., Brooklyn 1, New York.

FLOCK In Small Quantities. Apply velvet finish without compressor. Send for free list and instructions. Flox Finishes, East Stroudsburg, Pa.

NICHROME Wire styrofoam cutter. Complete plans to build, including nichrome wire \$2.50. Rogers Books, Box 3212, Fresno 66, California.

SECRETS of fine metal polishing and plating. Specially prepared home workshop brochure covering: Making your own polishing compounds; Silver plating pastes. Gold, Silver, Nickel, Copper, Brass plating without electricity or bungsomes equipment. Includes other hard to get information. All for \$2.00. Loyd Wolcott, Dept.-1, Antique Metalware Restoration, 226 Seale Road, San Antonio, Texas.

2477 PLANS, Patterns, things to make, do. Fun. Profit. World's greatest selection. New catalog 10c. Craftplans, 18250-B Harwood, Homewood, Ill.

NEW! Patterns, toys, novelties \$1.00. Beautiful knick-knack shelf patterns \$1.00. Jordan, 79 Devon, No. Arlington, N. J.

67 OLD GOLD, JEWELRY, WATCHES, ETC.

WANTED, gold, silver, platinum, scrap (any form), coins. Information free. Wilmot's, 1067 Bridge St., Grand Rapids 4, Michigan.

USED and new watches \$2 up. Free Catalogue, Southern Watches, 5-PS So. Wabash, Chicago 3.

HIGHEST Cash for Gold, Teeth, Jewelry, Rings, Diamonds, Watches, Silver, Platinum. Mail Articles Today. Free gift with information. Chicago Gold & Precious Metals, 6 E. Monroe, Dept. 4957, Chicago 3.

CASH Immediately For Old Gold, Jewelry, Gold Teeth, Watches, Diamonds, Silverware, Spectacles, Platinum, Mercury. Free information. Rose Industries, 29-Y East Madison, Chicago 2.

NATIONALLY advertised diamond rings and jewelry at wholesale prices. Free catalog. Newland, Box 929, Waterbury, Conn.

68 TOBACCO & PIPES

HAND Carved briar pipe, \$2.00. Catalog. Hobart Schacht, 804 No. Jefferson, Huntington, Indiana.

70 OF INTEREST TO WOMEN

GENUINE Interpretations of Famous Perfumes, by different names—Fairness and Persevere. \$6 Dram value, for \$1.75. Excel Perfumery, 614 Main Street, Green Bay, Wisc.

EARN Money At Home making gorgeous candles for holidays and occasions, with our unusual molds. Free Facts. Candle Institute, Dept. X-19, Fallbrook, Calif.

EARN money with newspaper clippings! Details Free. Hillard, Jett, Ky.

MAKE \$25-\$65 weekly typing at home. Details \$1. Bonco, 130 Cumberland, Mason-town 1, Pa.

71 FOR SALE MISCELLANEOUS

CUCKOO clocks \$3.48 up. Free brochures. Box 19101, Louisville 19, Kentucky.

HEARING Aid: British Medicare Model \$49.95. 10-Day Money Back Guarantee. Audium, 89-40 163rd St., Jamaica 32, N. Y.

72 WANTED TO BUY

QUICKSILVER, platinum, silver, gold. Ores analyzed. Mercury Terminal, Norwood, Massachusetts.

74 RAZOR BLADES, SHAVERS

SAVE Money! Faster, Smoother Shaves. 100 Blades—\$3.98. Postpaid. Moneyback Guarantee. Wecco Industries, Columbus, Georgia.

75 TATTOOING SUPPLIES

LEARN profitable, fascinating Tattooing. Illustrated Information \$1.00. Zeis, 728-B Leslie, Rockford, Illinois.

77 TREASURE FINDERS & GEIGER COUNTERS

TRANSISTOR Treasure Detectors, underwater detectors. Many models. Free catalog. Gardiner Electronics Co., Dept. 1, 2545 East Indian School, Phoenix, Arizona.

EXPLORE Underground, years ahead transistor Metrotech locators detect Gold, Silver, Coins, Relics. Information Free. Curt Fisher, Dept. D, Box 793, Menlo Park, California.

TREASURE, Gold, Silver, Relics. Find them with new 1963 models. Free information. Raytron, Box 715, North Hollywood, California.

TREASURE. Find gold, silver, relics with super powerful, Detlectron locators. Free information. Detlectron, Dept. PS-5, San Gabriel, California.

SENSITIVE transistor treasure finders. \$19.95 up. Free catalog. Reliko, Box 10563, Houston 18, Texas.

FUN & Profit finding buried treasure, relics with Transistor M-Scope. Booklet, interesting customer comments. Free! Terms. Fisher Research, Dept. DX, Palo Alto, California.

NEW Coin Locator! Free literature! Howe, 811-A Kansas, Atchison, Kansas.

TREASURE Finders—Easy to make electronic kits or assembled models. Underwater models available. Free literature. Electronic Applications, Inc., Dept. S, Box 6095, Alexandria, Virginia.

78 WATCH REPAIRING

WATCH and clock repairing books. Free catalog. North American, 2320-BE Milwaukee, Chicago 47, Illinois.

79 MISCELLANEOUS

FREE Wholesale Catalog! 100,000 Products . . . Tremendous Discounts! Taylor Distributors, Newton 3, New Jersey.

ROCKETS: New illustrated catalog 25c. Single and Multistage Kits, Cones, Engines, Launchers, Trackers, Technical information, Etc. Fast Service. Estes Industries, Penrose 34, Colorado.

WHAT Can I do for you in New York? Harding, Box 111, N.Y.C. 28.

SO. CALIFORNIA . . . Save needless worry and expense. Send \$1.00 for complete information on trip and arrival. Also job and housing situations. Dixon, Box 301, Huntington Park, California.

INSTANT Spanish. New. Streamlined Method. Send 25c For Complete, Trial Lesson. Trader, Box 3488-R, Ridgecrest, Calif.

POSTPAID From Holland. Clocks, dolls, lamps, Delftware plates, etc. Illustrated list, 20c. Melco, Box 69, Edwardsville, Illinois.

RECEIVE Mails—Offers. From Wholesalers, Manufacturers, Publishers. Everywhere. Get Listed, 25c. Rorick's, Cincinnati 26, Ohio.

CUCKOO Clocks. Free Catalog. Simmons Bros., 10575 Robinson, Arlington, California.

KEEP Your Mail Box Loaded. Get Listed, 25c. Frankland Enterprises, P.O. Box 112, Chicago 17, Ill.

LUMIROD Easily Forms To Many Shapes. Latest In Lighted Displays. Basic Kit \$2.00, Postpaid. Q-Arc Devices, Box 47876, Los Angeles, Calif.

FREE! "Ways to Meet Women!" Guide, Box 362-SF, Yorktown Heights, New York.

80 PERSONAL

"RULE Others with your Thoughts." Telepathy. (Adults.) Write: Clarion, Box 9309-S6, Chicago 90.

INDEPENDENT Thinkers — investigate Humanism, the scientific, personal philosophy! Free literature. American Humanist Association, Dept. PSM2, Yellow Springs, Ohio.

LOANS by mail, \$100-\$600. Anywhere. Confidential. Write Union Finance, Dept. PS, 323 E. Camelback, Phoenix, Arizona.

MEXICAN Law Practice. 1203 Arizona Ave., El Paso, Texas.

"WHO, ME?" Yes, You! "How To Wake Up Life-Changing Winning Ability" sent you free. Write: President, Box 1924-O, Louisville 1, Ky.

ESCAPE Second Death. Write: Scripture Witness, 90 Coral Street, Paterson 2, N. J.

FOUR "Will" Forms and "Instruction Booklet by Lawyer," \$1.00. National, Box 48313-PS, Los Angeles 48, California.

HANDWRITING analyzed by certified graphoanalyst. Character trait one dollar. General analysis three dollars. Lois Reading, 1731 N.H. Ave. N.W., Washington 9, D.C.

80A REMAILING SERVICE

MIAMI Beach remails 25c; 5 for \$1.00. Monthly \$3.00. National, P.O. Box 678-B, Miami Beach 39, Florida.

CONFIDENTIAL New York City Mail Address. Remailing. Forwarding, \$3 Month. Details Free. G. Martin, Suite 212B, 136-04 Northern Blvd., Flushing 54, New York.

HAWAII Secret Address. Receiving. Forwarding. 25c. \$3.00 Monthly. Postcards. Coe, Box 984-A Kailua, Hawaii.

CONFIDENTIAL Address. Letters remailed 25c. Foreign remailing. Stamp. West, SF-2617 Armacost, Los Angeles 64, California.

LETTERS 50 cents. 3—\$1. Glasgow, London, Edinburgh, Dublin, Cohar 47 Oswald Street, Glasgow, U.K.

LETTERS remailed 25c, confidential! Robert Carter, Box 742, Los Angeles 53, Calif.

SECRET Mail Receiving—Forwarding. Hedgpath, 406 South Second, Alhambra 24, California.

REMAINS. Single \$.25. Monthly \$3.00. J.L.P., Box 817, Ft. Lauderdale, Florida.

REMAILING 25c each, \$2.50 month. Oab Service, 4817 Mayfair, Fort Worth 16, Texas.

CONFIDENTIAL Remailing 25c. \$3.00 Monthly. Hoffman, Box 2641, Amarillo, Texas.

REMAILING. Forwarding 25c. \$3.00 Monthly. P.O. Box 95, Spokane 10, Wash.

80B LOANS BY MAIL

BORROW \$100 to \$1000 by Mail. Quick, Easy, Private. No Co-signers. Repay in 24 small monthly payments. For the amount you want write today to Dial Finance Co., 410 Kilpatrick Bldg., Dept. 5-215, Omaha 2, Nebraska.

BORROW \$1,000 AIRMAIL! Repay \$44.82 for twenty-nine months. State licensed. Postal Finance, Dept. 11-E, Kansas City 1, Kansas.

MONEY Problems Solved quickly. It's easier than you think. B.I.C. Cash-By-Mail loans easily arranged, 24-month schedule. \$100.00 to \$600.00. No co-signers or security. Write for application. B.I.C. Loans, 1004 S. Walnut, Hutchinson, Kansas.

NEED Money? Do as thousands of people are doing—borrow money you need from National Loans by mail, quickly, confidentially. Easily arranged, repay in small monthly amounts. Borrow \$100.00 to \$600.00 without collateral or co-signers. Write—tell us how much you need now. National Loans, Dept. 7, 101 S. Tejon, Colorado Springs, Colorado.



NOW YOU CAN SOLVE "TOUGH" MATH PROBLEMS LIKE THIS!

$$47892 \times 39421 = ?$$

AS EASY AS $1 + 1 = 2$

GET A BETTER JOB WITH HIGHER PAY,
SECURITY IN THIS ATOMIC AGE!

This man is multiplying numbers that should ordinarily produce the answer in about 4 minutes. The answer appears on his blackboard in less than 15 seconds flat! Yet he knows little about math! As a matter of fact he failed arithmetic in school. Read on to discover the fantastic new method that even a child can learn easily in just a few short hours—at home...

Yes, in just hours you can turn into a "math wizard" even though you know little about arithmetic! Surprise your friends with your "E-Z MATH" ability... enjoy job security and advancement... a better job... Increase your self-confidence and prestige—all through amazing new "E-Z MATH".

The world is moving fast these days. In good times and bad the ability to handle mathematical problems in our age of electronics, automation and nuclear science is becoming more and more necessary for promotion on the job and for higher pay. If you don't think you have what it takes—and if you believe that "math" is beyond your power—then you're in for the biggest surprise of your life!

For now you CAN learn to DIVIDE, MULTIPLY, ADD and SUBTRACT figures not only quickly and easily—but also in a FRACTION of the time the average person requires! You can actually solve such tough problems as multiplying a 5-figure number by a 7-figure number in your head without ever touching pencil to paper... or dividing 836791 by 284, for example, in exactly 15 seconds—even if you "flunked" math in school!

The secret of success in "math" is NOT laborious study and wearisome practice—but, on the contrary, knowledge of SPECIAL SHORT CUTS, LITTLE-KNOWN METHODS of calculation and arithmetical "tricks" that take the work and gamble out of figuring. These methods—so new and radical that they have not yet been incorporated in our school systems—take but a few hours to learn. Yet they permit you to OUT-THINK and OUT-FIGURE the average high school and college graduate who hasn't had the benefit of these amazing methods! You can even BEAT AN ELECTRIC CALCULATOR in answering many problems!

**Figure with
SPEED and ACCURACY!**

"E-Z MATH" shows you in plain, easy-to-understand language how to cut figuring time in HALF and even in QUARTERS—and at the same time arrive at the correct answer in every case! The methods and short cuts you learn in "E-Z MATH" are fool-proof... require almost NO memorization... and are so practical that you'll find yourself using these systems virtually every day. You'll become an expert in no time at all. Before you know it—you're ready to move into that important job you've always wanted... to drive ahead and in greater responsibility at higher pay... and to amaze, surprise and delight your friends with your new magic powers of mental arithmetic! Yes, "math" will open up new opportunities for you, since the person with "math" know-how can just about "write his own ticket."

Sharpen Your Brain Power— with Short-Cut "E-Z MATH"!

Imagine being asked to divide 38634 by $89\frac{1}{2}$ —and rattling off the answer absolutely correctly in 7 seconds! Or—multiplying 369.34 by 982.7 and coming up with the correct result in 11 seconds! Or adding 29 numbers each with 6 digits—and supplying the right total every time! People will GASP at your fabulous lightning-quick mind. You'll be able to JUGGLE numbers... do STUNNING TRICKS... amaze your friends and boss—and be a "master mind!"

With a knowledge of "E-Z MATH" you no longer need be puzzled by such every-day figuring as computing interest charges on installment purchases... division, multiplication and addition of fractions... adding long rows of numbers with 100% accuracy... adding and subtracting fractions from whole numbers—plus many, many other practical and valuable pointers you will use daily to your advantage. The few hours you spend with this course will really pay off. Numbers are the basic instrument of all scientific and technical work. The man or woman who can use "math" is rewarded, recognized quickly, moves ahead in his job faster and more surely!

Order Today on No-Risk Free Home Trial!

Send for "E-Z MATH" today on our no-risk money-back guarantee: use the book for 30 days... prove to your own satisfaction how far a knowledge of "E-Z MATH" can advance you in business and social life. If you don't agree that this is the best investment you've ever made... if your family and friends aren't AMAZED by your new ability—return the book for full and prompt refund.

"My 10-year old had nearly always failed arithmetic with old-method arithmetic. Then he found my copy of 'E-Z MATH'. Now in less time than you can put the numbers on a blackboard, he can multiply 8391726547 by 12. It's amazing and incredibly easy. I use it myself on my job and my wife uses it to check grocery lists."

A Father
"You have a unique new teaching approach for which I compliment you. It's the best I have ever seen. Pupils' marks seem to be climbing as a result. Should help in any job. Excellent for home tutoring use."

—SCHOOL PRINCIPAL
"Thank you! Thank you! Thank you! All our children are using your system too, and it is terrific. My husband and I are using it—and it works! My husband has already received a job advancement with tremendous boost in pay. Best investment we have ever made!"

—HOUSEWIFE

CAN YOU SOLVE THESE EVERY-DAY BUSINESS AND SOCIAL ARITHMETIC PROBLEMS IN THE TIME ALLOWED? YOU CAN DO THEM EASILY EVEN WHEN BLINDFOLDED—AFTER YOU'VE READ "E-Z MATH"!



Blindfold yourself and have someone call the following numbers to you as you add them:

739
463
906
785
642

(Solve in 6 seconds) ?

$$9864372 \div 8146 = ?$$

(Solve in 9 seconds)

$$\frac{4}{7} \times \frac{9}{4} = ?$$

(Solve in 4 seconds)

$1\frac{3}{4}\%$ interest per month amounts to what percentage yearly?
(Solve in 4 seconds)

$$367 \times 75 = ?$$

(Solve in 3 seconds)

WHAT IS "E-Z MATH"?

"E-Z MATH" is based on an amazing new method of working with numbers—easier to learn and remarkably faster and more accurate than you ever dreamed possible when you took math in school. You'll be shown the newest way of reading numbers—just as though they were words—and of adding and subtracting them almost at a glance—INSTANTLY! You'll be shown a unique new technique for adding hundreds and even thousands of numbers without ever making a mistake... yet now on you'll whiz through all figuring problems without wasting your valuable time—through income tax, checking grocery lists, homework—as fast as a calculator. You'll never again dislike or avoid numbers—you'll actually ENJOY using them to get ahead in business!

WHAT THEY SAY:

"My employee, Joe Malone, asked for a better job. I recommended he read 'E-Z MATH'. Now that he can do 'tough' problems easily, I've promoted him to head of his department with a \$35. weekly increase in pay. I now suggest all employees read 'E-Z MATH' if they want to get ahead in their jobs."

Business Executive

MAIL NO-RISK FREE HOME-TRIAL COUPON NOW!

E-Z MATH PROGRAM DEPT. R-15
285 Market St., Newark, NEW JERSEY

OK! Prove to me that "E-Z MATH" can bring me higher pay, prestige and social advancement! Rush book to me postpaid in plain wrapper for 30-day free examination and use. If I don't agree with everything you say about "E-Z MATH"—I may return book for prompt refund. I am enclosing \$1.98 as payment in full.

NAME _____ AGE _____
(Please Print)

ADDRESS _____

CITY _____ ZONE _____ STATE _____

E-Z MATH PROGRAM
© Entire contents copyright 1963

DEPT. R-15 285 Market ST.
Newark, NEW JERSEY



"My salary has more than doubled since enrollment with LaSalle and due to my fine training is still growing."

—William T. Black,
Canoga Park, Cal.



"Without the opportunity to study I could not qualify as controller of a concern with millions of assets and sales. Thanks to LaSalle."

—Walter Zielke,
Bridgeman, Mich.

"Eight months after I started the course I got a job in Accounting. I now earn 3 times my former pay as a service station attendant."

—Robert Fish,
Holbrook, A

Regardless of previous experience or

LaSalle trains you at home fastest-growing profession

**Students report up to 56% increase
in income the first year**

ACCOUNTANTS make big money — and there are more jobs available today in Accounting than there are trained people to fill them.

The Accountant is the control center of modern business. The financial functioning of every department depends on his information and skills. You can step up to this privileged position through LaSalle training.

**Training duplicates
actual on-the-job-experience**

You can take LaSalle Accounting training at home, in your spare hours, without any previous bookkeeping experience. You set your own pace; you are neither hurried nor slowed. LaSalle's distinguished faculty starts you at the beginning; explains every basic Accounting principle and method; gives you actual Accounting problems with your work; shows you exactly how accountants on the job handle these problems. Your training is complete, practical, and enjoyable. You are thoroughly prepared for practically every Accounting task you may handle in the business world.

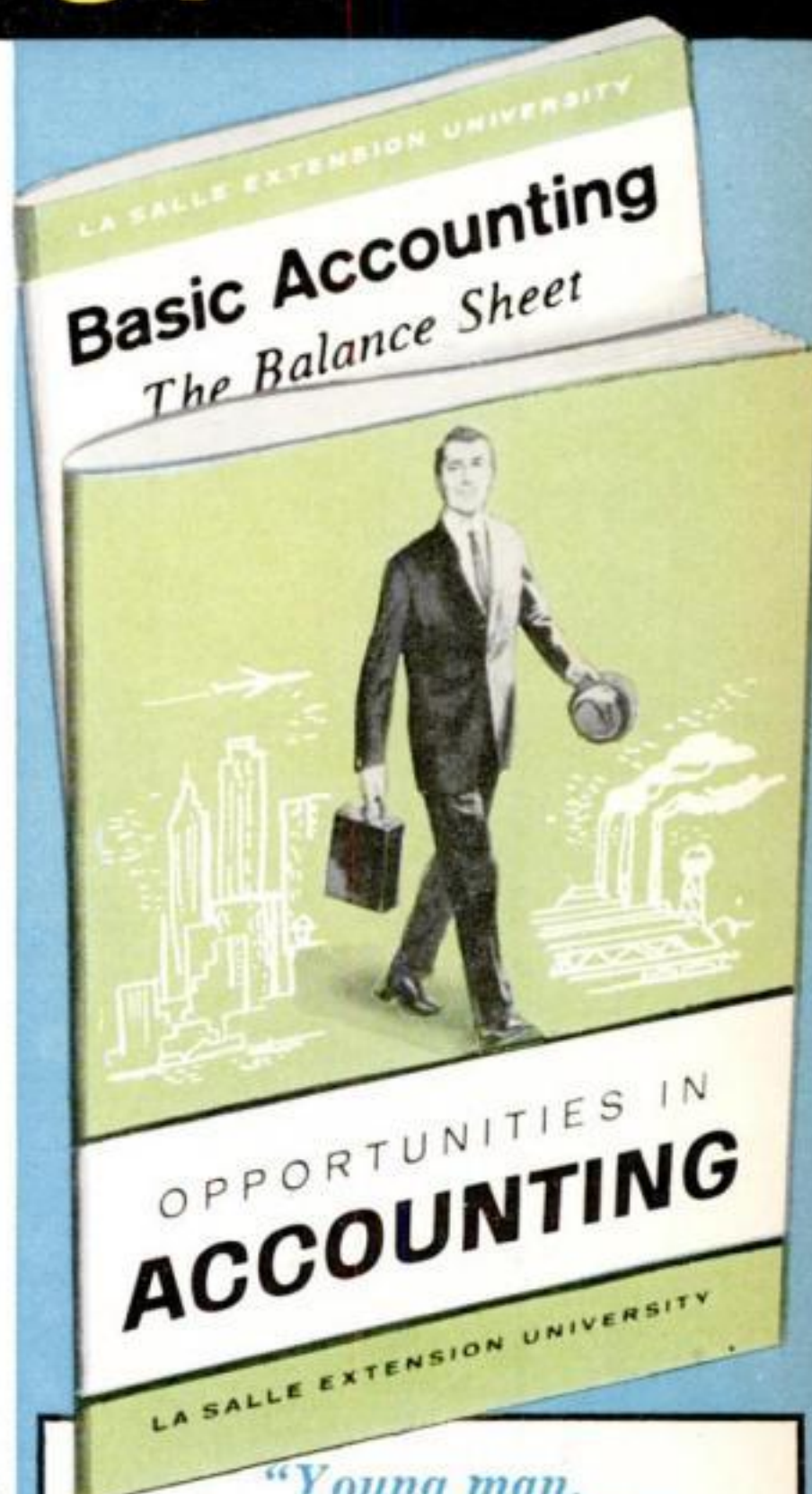
Your career could not be in more experienced hands. For more than half a century, LaSalle has been a world leader in business training, with over 1,000,000 students. More than 5,500 CPAs have trained with LaSalle. A LaSalle diploma is a credential recognized and respected by America's biggest companies.

Mail card for Free Booklet

If you are truly seeking a more rewarding job, higher pay, and all the good things that come with success, you owe it to yourself to read LaSalle's famous booklet "Opportunities in Accounting." With it you will receive a free sample lesson in Accounting which will demonstrate how LaSalle makes home study interesting and practical. Mail card today to LaSalle, 417 South Dearborn Street, Chicago 5, Illinois.

Accounting offers you

- ✓ **HIGH INCOME**
- ✓ **RAPID PROMOTION**
- ✓ **LIFETIME SECURITY**
- ✓ **DIGNITY AND PRESTIGE**



*"Young man,
be an Accountant!"*

"The whole profession makes good money. According to a recent survey of 1,700 chief executives of listed companies, more of them started in finance and accounting than in any other department."

—ESQUIRE MAGAZINE

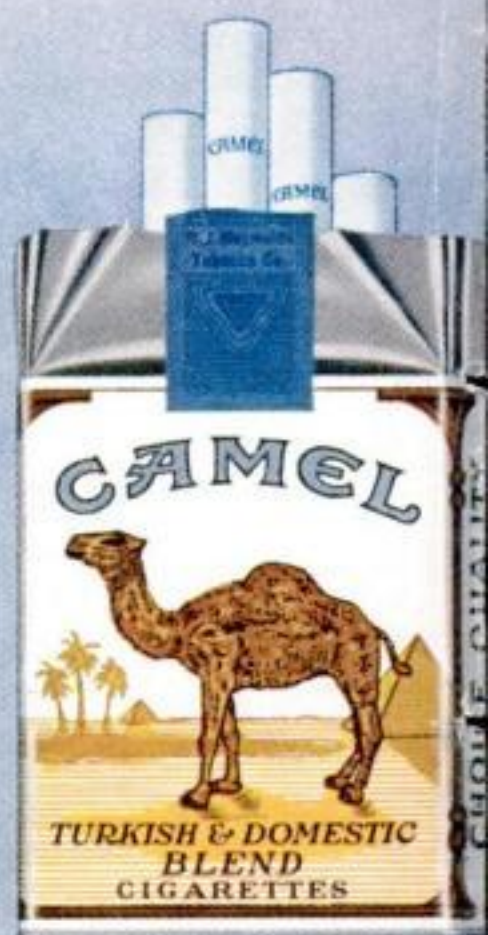
"The tremendous growth of the accounting profession is still accelerating: the profession expects to pick up an additional 40,000 CPAs by 1970."

—FORTUNE MAGAZINE

CAMEL

EVERY INCH A REAL SMOKE!

Those in the know go for Camel...
a real smoke...for real smoking
satisfaction. Get the clean-cut
taste of rich tobaccos. Get with
Camel. Every inch a real smoke
...comfortably smooth, too!



The best tobacco
makes the best smoke

JIM ARENDER —
World's Champion
Parachutist.
His cigarette? Camel.